

**Report on the Plan for Fielding the First Digitized Division and
First Digitized Corps**

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EXECUTIVE SUMMARY

The Army will develop the enhanced capabilities of the Objective Force and the Interim Force by harnessing the power of information technologies that have been part of Army modernization programs for several years. Through a process called Force XXI, the integration of these technologies into combat and supporting systems—a broad effort referred to as digitization—is well on the way to realizing tremendous advances in warfighting effectiveness. The Army has capitalized on this increased effectiveness by creating Division XXI: a new design for mechanized formations that makes them more lethal and survivable by incorporating information technologies that provide near real-time situational awareness. In turn, increased effectiveness enables a reduction of the number of combat vehicles in the Division, which improves the deployability of the unit. A parallel effort to enhance light force capabilities through application of information technologies is also underway.

Fiscal Year 2001 Army Posture Statement

The U.S. Army has embarked on a process to take advantage of advances in information technology by developing and fielding information technologies throughout the force. This process, called Digitization, applies digital information technologies to acquire, exchange, and employ data throughout the battlespace. This report provides the current status of Army efforts to achieve the first Digitization milestones, together with additional information about Army experimentation plans that support the Transformation Vision. The report will also address joint and combined interoperability initiatives, protection of digitized information systems, Reserve Component digitization, and the process to redesign the Army corps. This is the third annual report on the status of the First Digitized Division and First Digitized Corps.

In October 1999, Secretary of the Army Louis Caldera and Chief of Staff of the Army General Eric K. Shinseki outlined a new vision for the Army, entailing a major transformation to address evolving strategic requirements. Based on this vision, the Army has begun aggressively revising its modernization strategy to

support transformation to an Objective Force capable of dominating at every point on the spectrum of operations. The Army will develop the enhanced capabilities of the Objective Force and a precursor Interim Force by harnessing the power of information technologies that have been part of Army modernization programs for several years. Through a process called Force XXI, the integration of these technologies into combat and supporting systems—a broad effort referred to as Digitization—is well on the way to realizing several of the advanced situational awareness capabilities envisioned for the Interim and Objective Forces. Digitization will be a critical enabler of the new Army Vision.

The digitization strategy supports the Transformation vision through experimentation, evaluation, and acquisition to achieve specific results: equip the 4th Infantry Division—the First Digitized Division (FDD)—by the end of 2000, III Corps—the First Digitized Corps (FDC)—by the end of 2004, and the Transformation force. The essential components of digitization are inter-netted computers linked to sensors and satellite-based navigation systems through robust

communications networks. The Army is fielding a suite of digitized command and control systems, selectively procuring weapon systems designed for the digitized battlefield, and integrating required digital components on fielded systems to tap the potential of digitization.

The strategy continues selected elements of the Force XXI process in order to retain decisive capabilities. For both mechanized and light forces, the Force XXI process is the vehicle for harnessing information technologies and lethality enhancements to achieve a revolutionary advance in effectiveness. In past years, this process allowed the Army to examine thoroughly the impacts of digitization on Army, joint and coalition doctrine, soldier and leader training, organizations, and logistics.

When applied to mechanized forces, the Force XXI process resulted in the Army XXI design and the fielding of digitized divisions. Division XXI redesigns mechanized formations making them more lethal and survivable by incorporating information technologies to provide near real-time situational awareness. In turn, increased effectiveness enables a reduction in the number of combat vehicles in the Division XXI organization, improving the deployability of the unit. Relying on the enhanced capabilities provided by Digitization, the 4th Infantry Division (4th ID) has reorganized to a Division XXI structure that is 25 percent smaller than an Army of Excellence division. The reorganization of other mechanized divisions, to be implemented over the next few years, will make them more deployable and agile by reducing their size, yet maintain their current lethality. A parallel effort to enhance light force capabilities through application of

information technologies is also underway.

Integration of Reserve Components (RC) into the Army digitization strategy began in earnest with the RC units that are integrated into the First Digitized Division (FDD). The FDD will include an RC General Support Aviation Company, a Multiple Launch Rocket System (MLRS) Battery, and the Division Rear Operations Center. In addition, the Army is programming to digitize RC units that are part of the Corps Troops of the First Digitized Corps (FDC), which will be equipped by the end of 2004. RC units in the Corps Troops include: a U.S. Army Reserve (USAR) Chemical brigade, Army National Guard (ARNG) Field Artillery brigades, Air Defense Artillery battalions, and Signal battalions, plus RC Engineer units, and several combat service support (CSS) units.

The Army continues its efforts with the other services to ensure interoperability, seamless communications, and shared situational awareness throughout the battlespace. The Joint Contingency Force Advanced Warfighting Experiment (JCF AWE), which will occur in September 2000, is a culminating experiment supporting Joint Vision 2010 and Army Vision operational concepts of dominant maneuver, precision engagement, focused logistics, and full dimensional protection. The AWE loosely integrates distinct Service experiments through a common scenario and mutual interoperability opportunities. The scenario focuses on brigade and below light contingency forces conducting operations in urban and restrictive terrain. By leveraging each Service's efforts, the joint community will be able to achieve cost savings and improved capabilities.

The Army continues to pursue digitization with its major allies through cooperative development efforts. The Command and Control Systems Interoperability Program (C2SIP) focuses efforts to obtain command and control systems interoperability with our major allies. C2SIP efforts will lead to software that can be used on the component systems of the Army Battle Command System (ABCS) providing for the exchange of critical command and control (C2) and situational awareness information with systems of the United Kingdom, Germany, France,

Canada, and Italy. We are also working with our major NATO allies to enhance the digital interoperability of alliance artillery C2 systems through the Artillery Systems Cooperation Activities (ASCA) Interoperability Program. Improvements to short-range air defense are being addressed in the Low Level Air Picture Interface (LLAPI) program, a U.S.-German initiative with participation of other NADO nations. A major coalition digitization demonstration, under the sponsorship of the U.S. European Command (EUCOM), is being planned for late 2002.

ARMY DIGITIZATION STRATEGY AND THE FORCE XXI PROCESS

The Army's Vision points to a synergy of information and material technology, wielded by trained and committed people, that will revolutionize the effectiveness of the Army in order to match its capabilities with the Nation's strategic requirements. Advances in information, materials, and weapons systems technologies will make it possible for Objective Force units to achieve the same effects as today's forces with fewer, lighter systems. In turn, these technological improvements will enable new organizational and operational concepts that optimize the employment of Army and joint capabilities across the full spectrum of operations.

Fiscal Year 2001 Army Posture Statement

The Transformation Vision

The 21st Century holds great promise, but also potential menace, for our Nation. The dream of information age prosperity will also see an array of potential dangers to our national security interests, including "asymmetric" dangers, such as information warfare. Today, the broader requirements of the National Security Strategy (NSS) and National Military Strategy (NMS) demand that the Army be responsive and dominant across the full spectrum of operations. Due to the hard work of Army soldiers and civilians, coupled with the support of the Administration, Congress, and the Department of Defense, the Army is meeting its requirements as the decisive landpower component of the U.S. military; however, there remains a significant risk from some scenarios.

By announcing a new Vision for the Army that entails a major transformation, the Army has charted a new direction to meet complex strategic requirements.

Throughout this transformation, the Army will remain focused on the Objective Force, *a force that is strategically responsive and dominant at every point on the spectrum of operations*. To reach this goal, the strategy continues selected

elements of the Force XXI process in order to retain decisive capabilities and maintain combat overmatch. At the same time, the development of an Interim Force will provide a parallel capability that embodies Objective Force characteristics within the constraints of available and emerging technology (Figure 1).

For example, the Initial Brigade Combat Team (IBCT), to be fielded in 2000, will have a mix of current digital systems and commercial-off-the-shelf (COTS) systems. The Interim Force will be fielded after the first two IBCT's with a hybrid of digital systems ranging from current C4ISR to improved systems benefiting from revolutionary technologies. When technology permits, and with the support of the Nation's leadership, the Army will complete its transformation to the Objective Force. The requirement is for non-line of sight inter-netted C4ISR capabilities and maximized C4ISR and combat support and combat service support reach-back capabilities.

Meeting these requirements means making the Army more responsive, deployable, agile, versatile, lethal, survivable, and sustainable. These characteristics are necessary to meet the fast-paced, complex demands of the

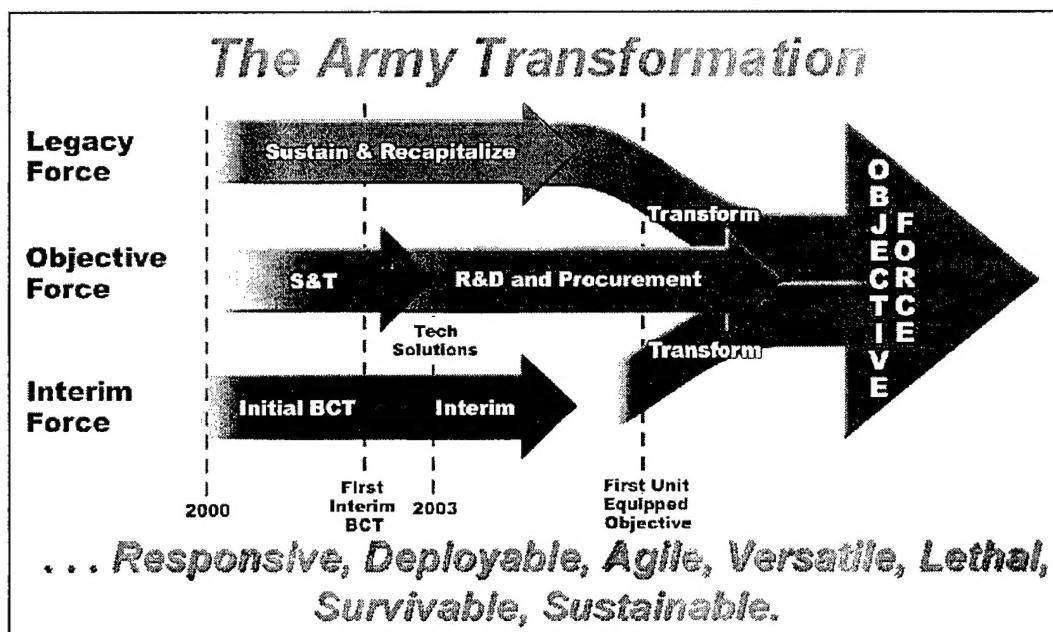


Figure 1
The Transformation Vision

current and future international strategic environment. To rapidly achieve and maintain the full spectrum dominance envisioned in the Vision, the Army must leverage the mature leading edge of commercial technology before our potential enemies. This will ensure our soldiers have an advantage on the battlefield and allow the Army to adapt new operational tactics, techniques, and procedures (TTPs) as a way of life. At the same time, the Army requires the ability to incorporate enhanced capabilities as they become available, because information technologies will continue to mature.

The Force XXI Process and Digitization

The Army has been using a process called "Force XXI" that will continue to guide Army efforts to evolve from the current Army of Excellence (AOE) structure to the Objective Force. Force XXI evolved from the requirement to

manage revolutionary change extending across virtually all of the functions of joint warfighting, and is the Army's method to advance into the 21st Century while maintaining the most capable land force in the world. Force XXI capitalizes on information technologies to attain real-time situational awareness and information dominance across the force (Figure 2). During the transformation to the Objective Force, the continuation of the Force XXI process is vital to sustain the capabilities of legacy forces, minimize the cost of operating aging equipment, and provide soldiers, leaders, and units the situational awareness, information dominance, and mental agility necessary to attain full spectrum dominance.

The Force XXI process leverages the power of digital information age technology through a series of experiments ranging from large-scale advanced warfighting experiments

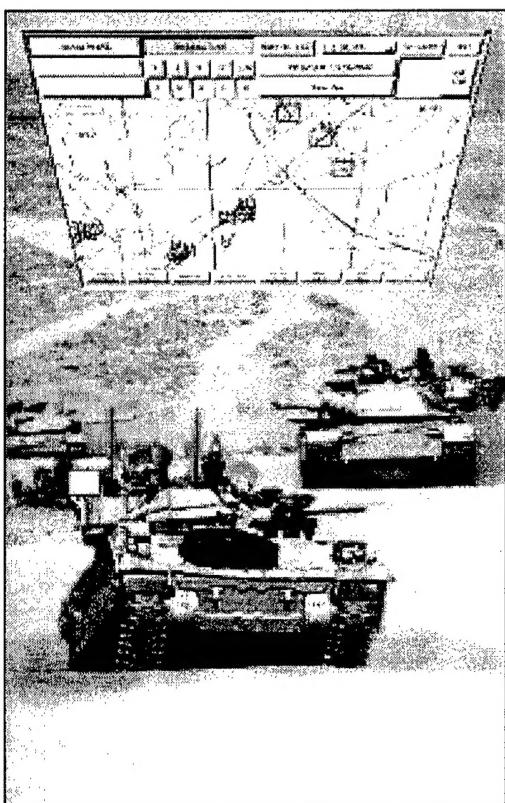


Figure 2
Situational Awareness

(AWEs) to smaller-scale efforts focused on particular functional areas, such as Advanced Concept Technology Demonstrations (ACTDs) and Functional Area Assessments. The process allows rapid evaluation of a broad range of technologies, identification of promising areas, and development of new systems in those areas. The lessons gleaned from these experiments compress the development cycle for new systems and inform changes to organizational structure, training, and doctrine. They also serve as a "forcing function" to synchronize and integrate all the pieces of a digitized force.

Digitization, a "subset" of modernization, is one of the most important elements of

the Force XXI process. It is an underlying guiding principle of modernizing the force. In 1994, a Special Task Force on Digitization identified the need to formalize the exploitation of information technologies within the modernization process and take full advantage of "Digitization." The efforts of this task force helped the Army recognize the potential value of incorporating digital technologies as part of battlespace command and control (C2) and produced systems, such as the Force XXI Battle Command Brigade and Below (FBCB2), to capitalize on that capability.

Digitization applies information technologies to acquire, exchange, and employ timely data throughout the battlespace. It is a strategy to take advantage of information age advances by developing and fielding information technologies throughout the force. Encompassing nearly 100 different Army programs, Digitization allows warfighters to share information without the constraints imposed by a hierarchical military organization. Through the application of advanced technologies on the battlefield, the Army is well on its way to establishing full situational awareness. This capability will allow all friendly forces to share a constantly updated and integrated view of the entire battlefield, no matter what the mission, to penetrate the enemy's decision loop, and act faster than he can react.

Digitization provides this shared situational awareness, which translates to a clear and accurate common relevant picture of the battlespace for leaders at all levels. The timely sharing of information significantly improves the ability of commanders and leaders to make decisions quickly, synchronize forces and fires and increase the operational tempo.

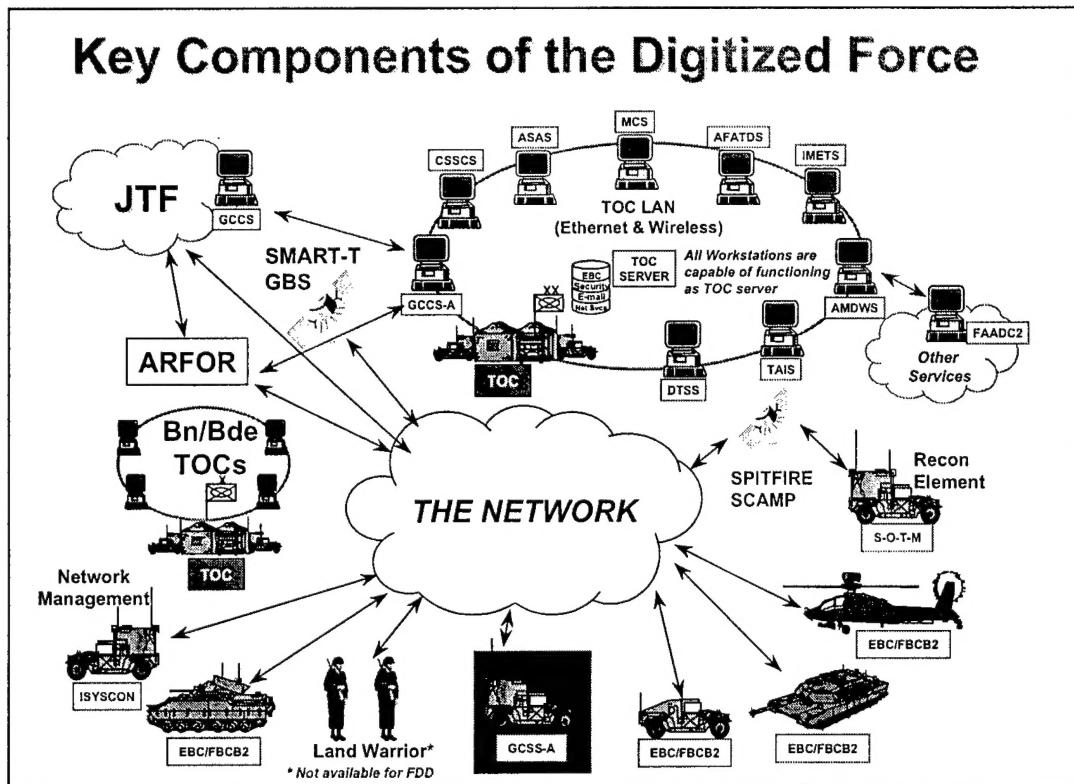


Figure 3
Key Components of the Digitized Force

Digitization is a means of realizing a fully integrated command and control capability from the strategic level to the platoon level (Figure 3).

Under the Transformation vision, the Army will not slow efforts to digitize the force and remains committed to fielding digital capabilities to support our soldiers, our units, and our ability to communicate securely. Digitization will be a critical enabler of the new vision and is considered an integral part of the many systems needed to develop the Objective Force. Digitization will allow these systems to operate synergistically by exploiting advances in information technology to achieve full spectrum dominance and improve Battlefield Organizational Effectiveness. The

Objective Force will be a knowledge-based force, using Information Age technologies to improve warfighting capabilities and ensure the Army maintains essential overmatch capabilities.

The digitization strategy supports the new Army Vision through experimentation, evaluation, and acquisition to achieve specific results: equip the 4th Infantry Division—the First Digitized Division (FDD)—by the end of 2000, III Corps—the First Digitized Corps (FDC)—by the end of 2004, and an Interim Brigade Combat Team (IBCT) in 2001.

The broad Digitization strategy involves leveraging the latest advances in information technologies from the

commercial sector (e.g. internet technology, portable laptop computers, direct broadcast TV), and *integrating* command and control software and hardware and the underlying communications systems with weapon systems to provide information sharing throughout the battlespace. The digitization process includes upgrading or modifying some legacy systems; adding to or “appliquéing” a capability to others; and ensuring future systems have information technologies “embedded” or built in as an integral part of the system when appropriate. All these capabilities are developed in compliance with a common set of joint standards to ensure interoperability and to enhance efficiency through software reuse.

Division XXI

Results of the Force XXI process for mechanized forces include the Army XXI Division, developed as the result of Force XXI lessons learned, and the impending fielding of digitized divisions. In sum, Force XXI will improve the capabilities of current forces by integrating technologies that will support interoperability during the transformation.

The Division XXI operates in a larger battlespace at a higher tempo than the Army of Excellence (AOE) Division. The Division is evolutionary in design, but revolutionary in its use of information technology. It improves the Army's deployability while enhancing its ability to dominate in decisive fights. This transition from the AOE design to the new Division XXI design is predicated on the enhanced capabilities digitized platforms will bring to the division. Consequently, the new division will employ fewer combat systems while leveraging information and

communications technology to provide shared situational awareness and increase effectiveness.

Key features of this new design include a reduction in the number of tanks and infantry fighting vehicles in mechanized battalions from 58 to 44 and an increase of almost 50 percent in the number of soldiers in infantry platoons. Division XXI also features a reconnaissance troop in each ground maneuver brigade and a battalion of MLRS. The total number of people in the mechanized division will decrease from 18,632 to 15,815. The new design will take several years to implement, but it will reduce the strategic lift requirement for affected divisions by 11 percent. It will also support the transformation by enhancing the decisive capabilities of the Legacy Force.

The 4th ID has already completed conversion to the Division XXI design, while other mechanized units have begun a transition. The 1st Infantry Division (Mechanized) (-) in Germany began a limited conversion to the new design in fiscal year 1999. The rest of the active mechanized divisions, except 2nd Infantry Division in Korea, will complete limited conversions in fiscal year 2001. Army National Guard (ARNG) mechanized forces began conversion to the limited Division XXI design in fiscal year 2000 with the 49th Armored Division and seven enhance separate brigades (eSBs). These divisions will complete the conversion to the Division XXI design only after receiving the digital enablers and other modernization on which the design was based.

More information about the status of fielding can be found in Annex A.

ARMY EXPERIMENTATION CAMPAIGN PLAN

Capitalizing on the momentum and successes of the Task Force XXI AWE and Division AWE (DAWE) to develop future warfighting capabilities, the Army Experimentation Campaign Plan (AECP) was initiated in November 1998. The AECP outlines the path to meet new challenges and requirements that have appeared during the process of change from a forward-deployed, threat-based Army to a force projection, capabilities-based Army. Currently, the Army is proceeding on a two-axis approach (Mechanized and Light), with the goal of operationalizing capabilities required for the Objective Force. AECP efforts are consistent with Army modernization goals of digitizing the force, sustaining essential

research and development, and focusing development for leap-ahead technologies (Figure 4).

Mechanized Axis Experimentation

The Mechanized axis of the AECP expands on the lessons and experiences of the Task Force XXI and Division AWE efforts. This axis includes equipping the 4th ID by the end of 2000, a two-phased Division Capstone Exercise (DCX) in 2001, a Corps AWE in 2002, and equipping III Corps by the end of 2004. The DCX will demonstrate go-to-war capabilities of the 4th ID with those digitized systems that have been provided by January 2001. The DCX involves a live, brigade-level National Training Center rotation at Fort Irwin, California in April, 2001 and a constructive, computer-based Battle Command Training Program

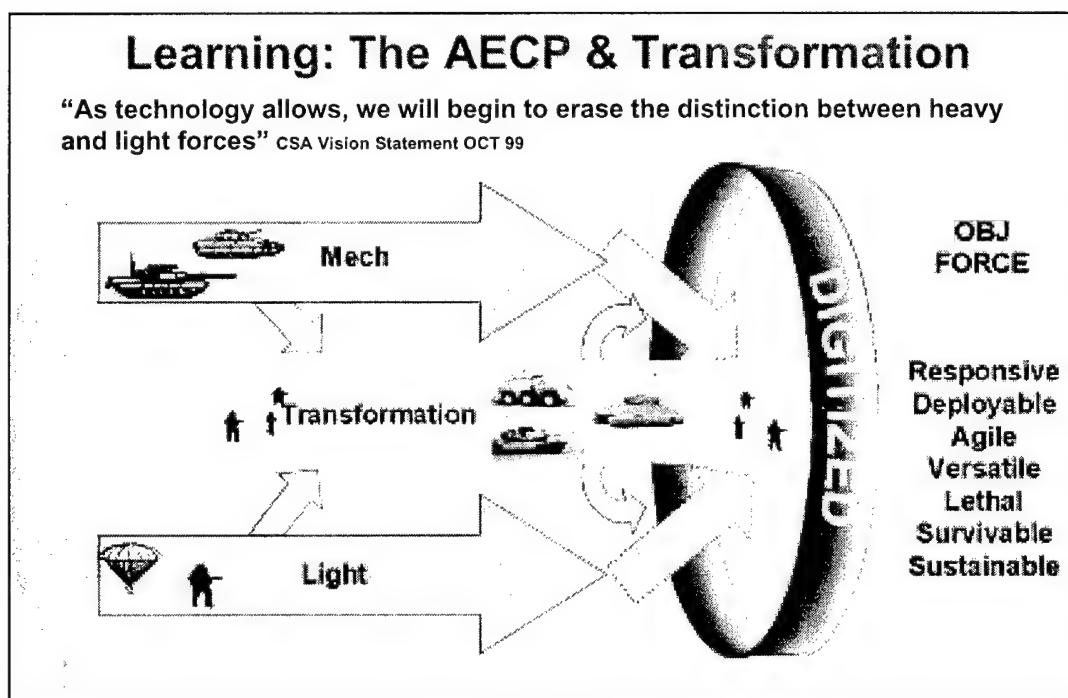


Figure 4
Army Experimentation

Warfighter exercise at Fort Hood, Texas in October 2001.

A Corps AWE (CAWE) is a multi-phased event including a III Corps Warfighter exercise in December 2002. It will be a constructive simulation exercise experimenting with digitization and the resulting ramifications on Corps operations. The CAWE will be used to determine the capability of Corps XXI to dominate an expanded operational battlespace with simultaneous tactical operations. Additionally, it will investigate the relevance of C2 packages. Lastly, it may explore individual contributions of other services in selected portions of the battlespace. An expected result of the CAWE is the ability to finalize the Corps Operational and Organizational design, and to lay the groundwork for transitioning doctrine and tactics to future operational environments.

The Mechanized Force axis will provide heavy forces with overmatching combat power, characterized by information dominance, and enhanced mobility, survivability and lethality in an expanded battlespace.

Light Force Experimentation

As part of the Army's commitment to success across the spectrum of conflict, the Army is applying lessons learned from mechanized axis experimentation to light forces. The light force axis aims to achieve increases in the lethality, survivability, mobility, and the operational tempo of light forces by providing situational awareness improvements comparable to the enhancements made to heavy forces. The key event of this axis is the Joint Contingency Force (JCF) AWE, which will occur in September 2000.

The JCF AWE is a culminating experiment that supports Joint Vision (JV) 2010 and Army Vision operational concepts of dominant maneuver, precision engagement, focused logistics, and full dimensional protection. Since U.S. Joint Forces Command (JFCOM) has embraced the JCF AWE as its inaugural joint experimentation opportunity, and as a major event in the Joint Experimentation Campaign Plan, it has taken on greater significance. It will loosely integrate distinct Service experiments through a common scenario and mutual operational interoperability opportunities. It focuses on brigade and below light contingency forces conducting operations in urban and restrictive terrain. JCF AWE objectives are written from a JV 2010 perspective. It has three overarching objectives:

- ◆ Determine how digital systems/linkages improve joint command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) effectiveness and efficiency through digitization, enhanced communications, and joint interoperability of systems, processes, and procedures;
- ◆ Determine how digital systems/linkages enhance the ability of joint contingency forces to execute operations in urban and restrictive terrain; and,
- ◆ Determine how digital systems/linkages enhance the ability of joint contingency forces to plan and execute early entry operations.

More information about the AECP can be found in Annex B.

EQUIPPING THE 4TH ID AND III CORPS

As noted, the Army's digitization strategy includes experimentation, evaluation, and acquisition to achieve specific results: equip 4th ID by the end of 2000 and III Corps by the end of 2004 (Figure 5).

The 4th ID (-) will be the First Digitized Division. It is organized as an armored division with two armored brigades at Fort Hood, Texas, and one infantry brigade at Fort Carson, Colorado. The division (-) at Fort Hood will be digitized by equipping the division with TRADOC identified Category 1 (Backbone) systems by the end of 2000, and the remaining systems generally in accordance with the Department of the Army Master Priority

List (DAMPL). The TRADOC list can be found in Annex A. The third brigade, at Fort Carson, Colorado will be fielded as a brigade set by the end of fiscal year 2004 and will receive the remaining systems in accordance with DAMPL. RC elements in the FDD will be equipped with the applicable Category 1 systems by the end of 2000.

III Corps, also at Fort Hood, Texas, will be equipped as the FDC by the end of 2004. This objective includes the corps headquarters and assigned units: 4th ID, 1st Cavalry Division (1st Cav), 3rd Armored Cavalry Regiment (3rd ACR), and III Corps troops. 1st Cav will be digitized by the end of 2003 with all three ground maneuver brigades equipped with embedded systems. The 3rd ACR will be equipped by the end of 2004. More information

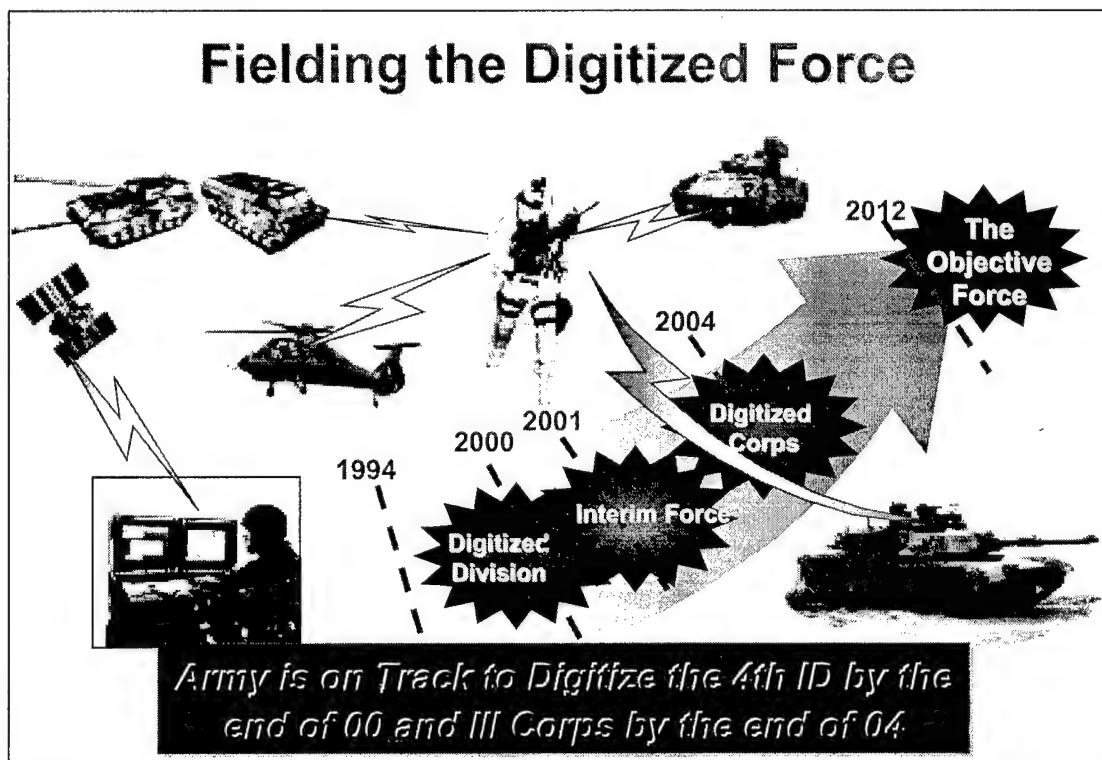


Figure 5
Fielding the Digitized Force

about the fielding status of the FDD and FDC can be found at Annex A.

Brigade Set Fielding

In December 1998, the Army made a decision to synchronize equipping and fielding of digitized units through a process called Brigade Set Fielding (BSF). BSF uses a "System of Systems" modernization approach to field digitized units by organization (brigade units), rather than by individually fielding pieces of equipment.

The BSF objective is to have trained and ready units transition through a thorough, coordinated program that includes all aspects of new Doctrine, Training, Leader Development, Organizations, Materiel, and Soldiers (DTLOMS). Afterwards, these brigade units emerge as fully trained and ready, modernized and

digitized units with the new, enhanced warfighting capabilities discussed above.

The 1st Cavalry Division at Fort Hood, Texas, will be the first division to go through the BSF process. It is scheduled to be fielded as a digitized division in 2003. More information about BSF can be found at Annex C.

COSTS FOR THE FIRST DIGITIZED DIVISION AND CORPS

Digitization is not a program in the traditional acquisition sense, but a strategy to integrate command and control systems, the underlying communications systems, and weapons systems to provide information sharing both vertically and horizontally, throughout the Army, as well as with Joint and Combined forces. The strategy includes the ongoing

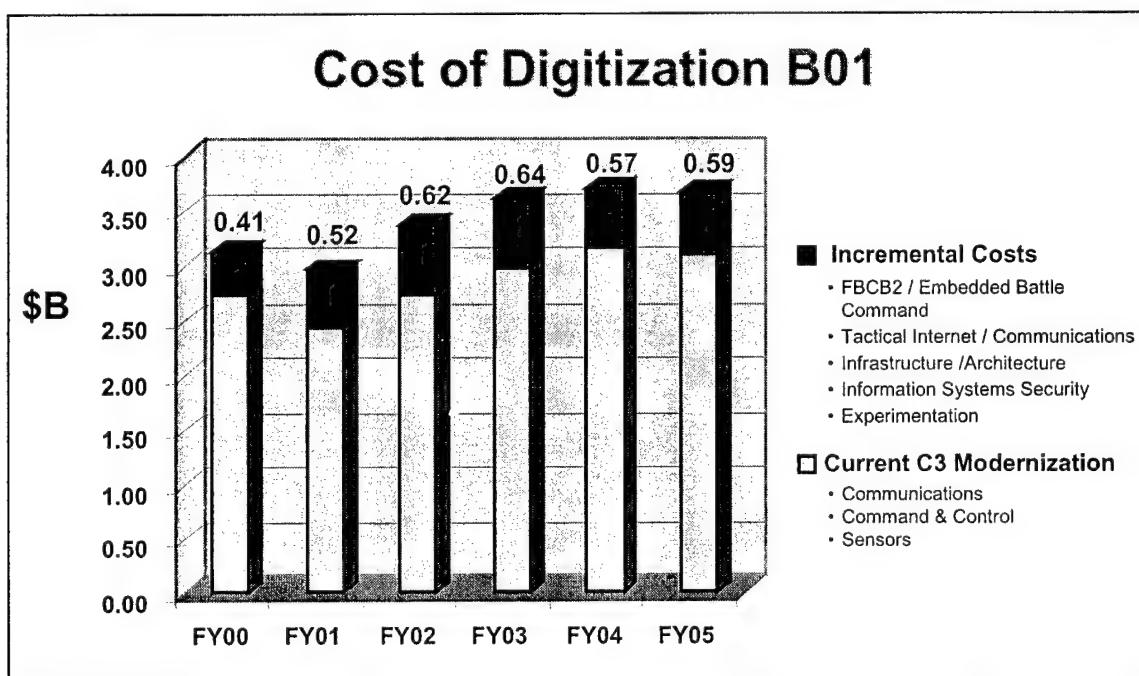


Figure 6
Breakout by Appropriation

modernization of approximately 100 systems in the fiscal year 2001 President's Budget, including RDTE, Procurement, and Operations and Maintenance (O&M) dollars. This includes the cost of integrating digital technologies into various C2 and weapon platforms. The fiscal year 2001 budget also continues our commitment to digitize the first corps (III Corps) by the end of 2004. The breakout by appropriation for each fiscal year is shown in Figure 6.

The Digitization strategy integrates command and control systems and their underlying communications systems with weapons platforms. It includes the training of soldiers to operate digital systems, the doctrine we use to employ these systems in a networked environment, and the resulting organizational structures that facilitate information sharing both vertically and horizontally, throughout the Army, as well as with Joint and Combined forces. The information sharing enabled by digitization significantly improves the ability of commanders and leaders to make quick decisions and synchronize forces and fires, increasing the tempo at which operations can be conducted. (Refer to the "Incremental" cost of digitization portions of Figure 6). Digitization-specific funds procure:

- ◆ Digital enablers such as the Tactical Internet, Force XXI Battle Command Brigade and Below (FBCB2) and Embedded Battle Command (EBC) software for situational awareness on the battlefield;
- ◆ Integration of these digital enablers into weapon system platforms (Aircraft Avionics; Abrams Tank Improvement Program; Bradley Base Sustainment; Longbow Apache; Kiowa Warrior; and

- Medium, Self-Propelled Howitzer);
- ◆ Interoperability among Army Battle Command Systems (ABCs)—including Tactical Operations Center (TOC) design;
- ◆ Digitization-related training and experimentation such as advanced warfighting experiments (AWEs);
- ◆ Information Systems Security Programs;
- ◆ Infrastructure and architecture, including combat development activities, Horizontal Battlefield Digitization, and C4I Systems Certification; and,
- ◆ Communications including the Joint Tactical Radio System (JTRS), Airborne Digitization, and Tactical Communications.

Most of the funds associated with Army digitization in recent years (\$3-4 billion per year) actually support related modernization efforts. These funds acquire information technologies that, without integration, do not achieve synergistic information dominance. (Refer to the current C3 modernization portions in Figure 6). These modernization funds procure:

- ◆ Communications equipment and systems (Single Channel Ground and Airborne Radio System, Enhanced Position Location Reporting System, Military Satellite Communications, and Global Positioning System);
- ◆ Command and Control systems (Maneuver Control System, Advanced Field Artillery Tactical Data System, Combat Service Support Control System, Forward Area Air Defense Command and Control, and All Source Analysis System);

- ◆ Sensors (Firefinder, Combat Identification, 2nd Generation Forward Looking Infrared Radar, and Aircraft Survivability equipment).

Detailed breakouts for the procurement costs for 4th ID and III Corps, by system and year, are shown in Annex D.

PROTECTION INFORMATION SYSTEMS

The Army accepts the fact that there are vulnerabilities inherent to digital components and the interconnecting of these devices, but also recognizes the globally connected environment in which it operates. The Army takes seriously the mission to protect its digitized systems while recognizing that total protection against all known and future vulnerabilities is not feasible. Therefore, the Army's intent is to field a digitized force with a level of information systems protection that is sufficient to allow critical functions and operations to continue amid a hostile Information Warfare Attack environment.

The Army is implementing two interlocking processes to provide protection of Force XXI information systems: defense-in-depth and information assurance vulnerability assessments. Defense-in-depth comprises several separate layers of defense based on network geography (such as perimeters, computer enclaves, etc.) and/or protection functionality (such as access control, intrusion detection, security management, etc.). The layers of protection—digital and internal firewalls, along with network and security management/surveillance and local workstation security—are based on the protection philosophies in the Army's C2 Protection Plan for Army XXI Information

Systems. The concept is analogous to the compartment design of U.S. Navy warships with an outer wall as well as multiple inner walls. Each wall plays a role in protecting, detecting and responding to threats against the transport network first, and information systems second, in order to assure the network's availability to the commander.

The second process uses information assurance vulnerability assessments to find and fix the areas of potential compromise in Army systems. It provides a means of determining the success of the protection mechanisms. Inherent in both processes is the recognition that we cannot provide absolute protection; rather, we must manage the level of risk.

The Army's approach to protecting Force XXI Information Systems is based on insights gained from Task Force XXI AWE and the DAWE, as well as studies and guidance on information warfare and related topics.

More information about Information System Protection can be found in Annex E.

DOCTRINAL AND TACTICAL CHANGES

The Army's current doctrine for the conduct of operations is changing as a result of the TFXXI AWE and DAWE. Even though the Experimental Force (EXFOR) planned, prepared for, and executed its assigned missions within current doctrinal concepts, the incorporation throughout the EXFOR of 21st century command and control technologies allowed the force to achieve the old analog doctrinal goals in a revolutionary way. For example, the

tactics, techniques and procedures (TTP) employed by EXFOR units were significantly impacted by the application of advanced information technologies to combat, combat support, and combat service support systems and organizations. During the DAWE, the concepts were validated as outlined in the TRADOC capstone document Department of the Army Pamphlet (DA PAM) 525-5. The AWEs culminated the first major step toward transforming the Army into a 21st century force.

In support of the Army vision, TRADOC continues to assess the impact of digitization on the Army's "how to fight" doctrine, to identify areas for possible refinement, develop a coordinated plan to implement required change, and to ensure the doctrine and TTP needs of the digitized Objective Force are met. As a result of these emerging doctrinal changes, the TRADOC Office of the Deputy Chief of Staff for Doctrine (DCSDOC) initiated an Army XXI Doctrine, Tactics, Techniques, and Procedures (DTTP) Analysis Project. DTTP will be an incremental, coordinated, and unified process paralleling innovations in materiel, training, and concept development embodied in the Force XXI process. The process is intended to:

- ◆ Assess the impact of digitization on the Army's "how to fight" doctrine and TTP;
- ◆ Identify areas for possible DTTP refinement; and,
- ◆ Implement a coordinated TRADOC action plan to manage DTTP changes, insuring TRADOC meets the Army's future doctrine and TTP needs.

Throughout the ongoing doctrinal development cycle, TTP updates and revisions must stay more in tune with input from the user community.

ANTICIPATED IMPACT ON THE TRAINING BASE

The Army will begin the transformation of the Institutional Army in the first phase of its transformation to the Objective Force. During this phase, the Army will address the systems, organizations, and processes by which the Institutional Army supports training, leader development, infrastructure management, sustainment, combat and materiel development, and well being. The transformation of the Institutional Army is essential to sustain readiness while developing and fielding the Objective Force.

Future operations will be characterized by joint and multinational operations, which will involve high-low technical unit interoperability. How the Army will conduct institutional and unit digital training during the transition to a fully digitized force and how we will continue to provide sustainment and refresher analog training are complex issues requiring innovative thinking. Digital training is additive in nature, because analog training will still be required to ensure that digitized units can function in a degraded mode. This will have a consequential impact on course length, structure, and instructor manpower requirements.

A dynamic digital training strategy is evolving, and an *Interim Institutional Digital Training Strategy* will be implemented to deal with the variables associated with fielding the FDD and FDC. The strategy under development will be applicable to the remainder of the

force as the legacy force, as well as Interim and Objective Forces both modernize and digitize. Lessons learned during equipment fielding and Army Experimentation Campaign process will also be incorporated into the strategy.

Historically, each system proponent develops a plan to field, train, and sustain a new piece of equipment. However, many of the new systems must operate together to accomplish the desired results or to create a synergistic effect. Initial and sustainment training for most systems will need to take place outside the proponent schoolhouse, and will require a synchronized effort between program managers and system proponents to produce stand-alone, multipurpose, interactive multimedia instruction, and embedded training components of the training support packages. Equipment density and fielding schedules will necessitate the development and sustainment of redundant training systems in the Army. The Army will be prepared to fully integrate digital training into existing institutional training not later than fiscal year 2002.

During the period 2002-2004, TRADOC will transition from the role of assisting the Program Executive Office Command, Control, Communications and Sensors (PEOC3S) and Forces Command (FORSCOM), providing sustainment and refresher training for digital tasks in units, to a traditional training development and institutional training role. A more detailed discussion of the impacts of digitization on the Training Base can be found at Annex F.

ANTICIPATED IMPACT OF DIGITIZING THE FORCE ON THE PERSONNEL SYSTEM

Soldiers remain the Army's most critical resource as it becomes digitized and transforms to the Objective Force. We have learned how to defend the nation's interests with a smaller force—yet remain formidable to our potential adversaries—by adopting innovative technology and doctrine. Incorporating cutting-edge methods is a two-edged sword, requiring higher skills of leaders, technicians, and soldiers, while potentially enabling others with lesser skills or training. As former Chief of Staff General Creighton Abrams said: "The Army is not made up of people; the Army is people." We need to ensure that the people who are the Army are taken care of, so that when they are needed, they will be ready, willing and waiting.

The Army's bold transformation plan to become more responsive, deployable, agile, versatile, lethal, survivable, and sustainable has significant implications on how the Army will man the force. The organizational structure will continue to evolve to meet challenges in the nature of society, technology, the threat, and fiscal constraints. Manning Army XXI as it transitions to the Army outlined in the Transformation Campaign Plan (TCP) will require soldiers with the same highly technical skill sets, requiring systems integration knowledge, skills and abilities.

As the Army transforms, required soldier attributes will become more specific. The need for "compressed capability," or greater skills resident in each individual, will require a greater investment in the professional development and training of every soldier since each must operate in

an environment that gives full range to his or her initiative as technology amplifies human potential.

The transformation vision hinges on fully manning the Army with sufficient numbers of quality soldiers. In an era of declining propensity of American youth to serve in the military, new strategies and additional resources will need to be identified to invest in this challenge.

A more detailed discussion of impacts of digitization on the Personnel System can be found at Annex G.

JOINT INTEROPERABILITY

Preserving interoperability between elements in the transforming Army, as well as between Army forces and those of other Services and nations, is essential to sustaining readiness and implementing the Vision. Having the inherent ability for such interoperability enables all key Objective Force characteristics, such as agility, deployability, sustainability, responsiveness, lethality, and survivability. As it modernizes its forces, the Army maintains and validates its interoperability through the Army Enterprise Strategy (AES), experimentation, and training with other Services and allies.

Joint experimentation offers an institutional mechanism to implement *Joint Vision 2010* by enhancing joint readiness, warfighting capabilities and Service interoperability. The recent formalization of a Joint Experimentation Campaign Plan (JECP) will further the development of systems and procedures that enhance joint interoperability. While the Services have cooperated with and participated in other Service experiments in the past, the establishment of a Joint

Experimentation Directorate by U.S. Joint Forces Command (JFCOM) provides a focus and structure that will improve interoperability. The JCF AWE in September 2000 will be the first joint experiment endorsed by JFCOM. It will integrate distinct Service experiments through a common scenario and provide an opportunity for assessing and improving interoperability.

The Army has led the way in developing a concept for joint experimentation based on its Force XXI experience. Both the TFXXI AWE and DAWE provided limited opportunities to experiment with Joint digital interoperability. The Army (through TRADOC) and USJFCOM are working closely to develop future experiments and exercises that test the digital interoperability of systems developed by the Services. The JCF AWE, scheduled for September 2000, will be the next experiment with Joint digital interoperability on a large operational scale. By taking the Army's experimental process to the joint level, the U.S. Armed Forces can equip, train, and modernize as they will fight—joint.

The Army's common, minimal set of information technology standards, developed on behalf of digitization, provided the basis for the Joint Technical Architecture (JTA) that is now mandated for use throughout the Department of Defense (DOD). The JTA provides the common, minimal set of information technology standards for use throughout DOD. For example, while there may be differences in fielding strategies, adherence to JTA standards ensures Service systems are capable of digital interoperability. A practical and observable commercial example of this strategy is the worldwide Internet, whose

technical standards were adopted as one of the bases for the JTA.

A more detailed discussion of Joint interoperability can be found at Annex H.

MULTINATIONAL INTEROPERABILITY

Our international digitization strategy extends current digitization efforts to allies and potential coalition partners through information exchange, cooperative programs, commitment to common operational, system, and technical architectures, and technology leveraging. International digitization programs promote multinational force compatibility, and allow the U.S. to leverage the research and development investments of multinational partners.

The ADO is responsible for the Army's International Digitization Strategy, which identifies high level requirements for interoperability. Practical steps towards interoperability are extensively worked at the weapon system level (such as the British and Dutch purchase of Apache).

A key component of the international digitization strategy is the use of demonstrations and exercises to evaluate developed capabilities in an operational environment, determine requirements for interoperability, and make allied partners aware of U.S. digitization efforts. More information about multinational interoperability can be found at Annex I.

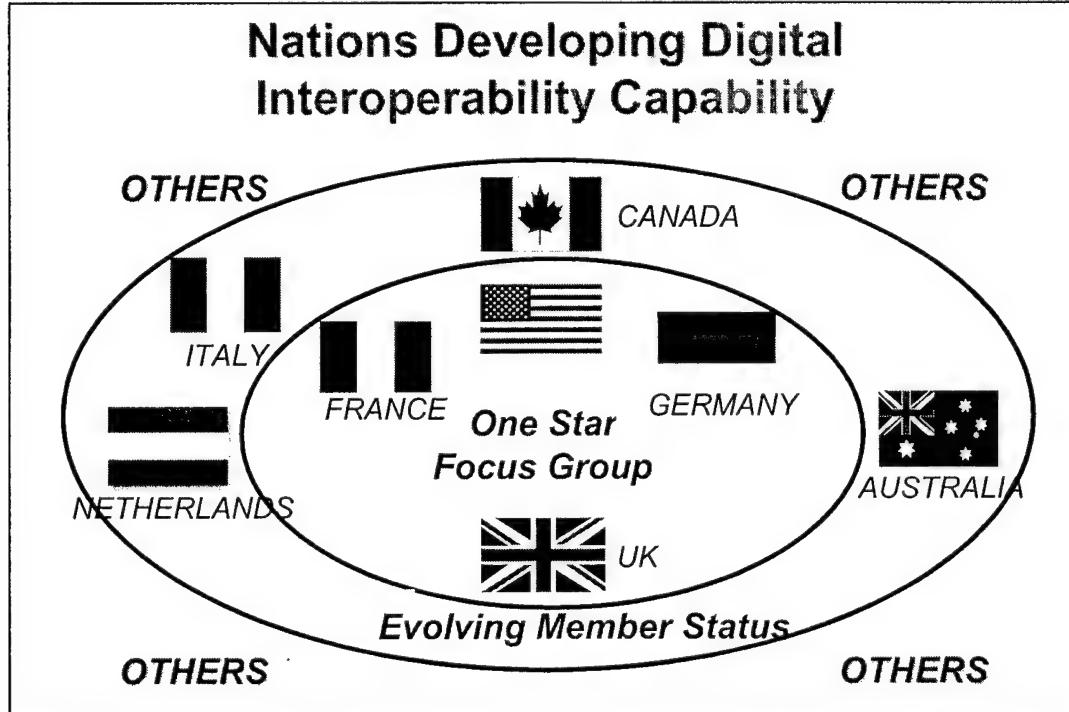


Figure 7
Nations Developing Digital Capabilities

CONCLUSION

The Army is preparing for the challenges of the 21st century through the Force XXI process, redefining how it will fight, organize, train, and command in the information age. The Army Experimentation Campaign Plan provides a roadmap for the Force XXI process that goes beyond the mechanized forces to experiment with light forces and the objective force. Digitization is a critical thread as the Army progresses toward the Objective Force. It enhances our warfighting capabilities to ensure that the Army remains the world's premier land combat force into the 21st Century. The information technologies being fielded today will provide the means for information dominance enabling U.S. Army, Joint and coalition forces to share a common picture of the battlefield while communicating and targeting in real or near-real time.

Digitization will reduce the "fog of war" and decrease decision-making time by optimizing the flow of information. It will allow the synchronization of combat power at critical times and places faster than an adversary can react and contribute to increased lethality, agility, survivability, and operational tempo while reducing the potential for fratricide.

The evolution into a 21st Century force with capabilities for continued full spectrum dominance is an attempt to meet head-on the warfighting challenges of the new century. Digitizing the 4th ID, III Corps, and the Transformation force will be a critical step in achieving this full spectrum dominance. The cumulative effect of the synchronized fielding of modernized, interoperable equipment is to place the Army firmly on the multi-year path to achieve the vision of the Objective Force. We are providing our soldiers with unprecedented advantages, combining the latest technology with those elements of character that have long made America's Army a most formidable foe.

Annex A

Fielding the Digitized Force

The Army's Digitization strategy will soon bear fruit as the 4th Infantry Division (4th ID) at Fort Hood, Texas, becomes the first division-sized unit to be considered digitized—the First Digitized Division (FDD). For the last several years, the 4th ID provided a mechanized Experimental Force (EXFOR) for new ideas and testing of information age technology. During this time, the soldiers of the 4th ID participated in several Advanced Warfighting Experiments, and numerous smaller tests and experiments. The experience gained through this process will be applied in the division's new role as the FDD.

Digitized Systems Primer

Digitization is subdivided into four components: communications systems,

command and control (C2) systems, weapons platforms with embedded C2, and other platforms (both weapons and support vehicles) with appliquéd C2. The systems that will be included in a fully digitized division have been classified by U.S. Army Training and Doctrine Command (TRADOC) into two categories, reflecting their contribution to information dominance (Figure A-1).

Category 1 systems are the "must haves," or enablers, that constitute the minimum essential communications backbone required to support the transfer of digital information over the battlefield. They include the Army's core command, control, and communications (C3) systems that make up the Army Tactical Command and Control System (ATCCS).

Category 1&2 Digital System Heavy/Light Integrated List							
MANEUVER	INTELLIGENCE	FIRE SUPPORT	AIR DEFENSE	MOB/SURVIVE	LOGISTICS	CMD & CNTL	
► MCS	► ASAS	► AFATDS	► FAADC2	► DTSS	► CSSCS	► SINCgars-ASIP	
► FBCB2	△ ACT ENCLAVE	♦ LLDR	♦ SENTINEL	♦ JWARN	♦ GCSS-A	► EPLRS-VHSIC	
△ LAND WARRIOR	♦ TUAV	♦ STRIKER	♦ JTIDS	♦ IMF RAPTOR	♦ SLDERS-3	► NTDR	
♦ LRAS3	♦ ACF (PROPHET AIR)	♦ FIREFINDER	♦ AVENGER STC	♦ WOLVERINE	♦ TC AIMS II	► JTRS	
♦ MFCS	♦ CGS/GSM	■ BPBT	■ LINEBACKER	■ NBCRS	♦ MTS	► SPITFIRE	
♦ BCIS	♦ IMETS	■ PALADIN	■ GRIZZLY	■ GRIZZLY	♦ RF TAGS	► WIN-T	
♦ A2C2S	♦ TROJAN SPIRIT	■ CRUSADER			♦ MC4	► SMART-T	
♦ OH-58D	♦ MITT/IDES	■ MLRS			♦ DVE	► GBS	
♦ RAH-66	♦ GBCS (PROPHET)	○ FDSW			♦ HEMTT (LHS)	► ISYCON (V1&V4)	
♦ AMPS	■ ACT ENCLAVE		► CAT 1 HVY & LIGHT		■ FRS-1 / HCMTP	► TOCS	
■ M1A2SEP or M1A1D			△ CAT 1 LIGHT ONLY		■ PLS (TMT)	♦ DMS	
■ M2/M3A3 or A20DS			♦ CAT 2 HVY & LIGHT			♦ ACN	
■ C2V			■ CAT 2 HVY ONLY			♦ PCS	
■ FSCS			○ CAT 2 LIGHT ONLY			♦ TAIS	
■ AH-64D							
■ LAND WARRIOR							
○ EFOG-M							
○ LOSAT							

LEGEND
HVY & LIGHT DIVS

►	CAT 1 HVY & LIGHT
△	CAT 1 LIGHT ONLY
♦	CAT 2 HVY & LIGHT
■	CAT 2 HVY ONLY
○	CAT 2 LIGHT ONLY

CATEGORY 1: Minimum essential digital C3 backbone requirements.
CATEGORY 2: Digitally enhanced wprns platforms, sensors, and spt systems.

VERSION 1.4
as of
15 SEP 99

A unit is issued all Cat 1 and all "currently available" Cat 2 systems inside its BSF(Bde Set Fielding) Digitization window or prior to entering it (IAW existing/unadjusted system fielding plans).

- Out-of-DAMPL/AOP changes and reprogramming as required to align CAT 1's with ADMS.
- AOP changes (approved by ADCSOPS-FD) for CAT 2 on case-by-case basis.
- CAT 2 fielding plans may be harmonized with ADMS, but no acceleration of production.
- BSF units normally receive one data radio type (EPLRS-VHSIC, NTDR, or JTRS).

CAT 1&2 "rules" and digital prioritization based on "first to fight" and early-deploy concept.
Must overhaul methodology in view of new RC Combat Axis and lower-priority eSB's.

TRADOC is proponent; annual review and update is ongoing.

Figure A-1
Category 1 and 2 Digital Systems

Many of these systems exist in the force today or are planned for fielding as part of the normal modernization process.

Category 1 systems consist of three interdependent components:

- ◆ The Tactical Internet (TI) which provides the connectivity backbone of digitization and is made up of voice and data radios, mobile subscriber equipment, and other communications systems including:
 - Area Common User System (ACUS)
 - Enhanced Position Locating Reporting System-Very High Speed Integrated Circuits (EPLRS-VHSIC);
 - Single Channel Ground and Airborne Radio System-Advanced

- System Improvement System (SINCGARS-ASIP);
- Asynchronous Transfer Mode/Future Small Extension Node (ATM/FSEN) switches and;
- Integrated System Control for network management (ISYSCON);
- ◆ ATCCS which links the component systems of the Army Battle Command System (ABCS) in a common software environment:
 - Maneuver Control System (MCS),
 - All Source Analysis System (ASAS),
 - Advanced Field Artillery Tactical Data System (AFATDS),
 - Forward Area Air Defense Command and Control System (FAADC2), and

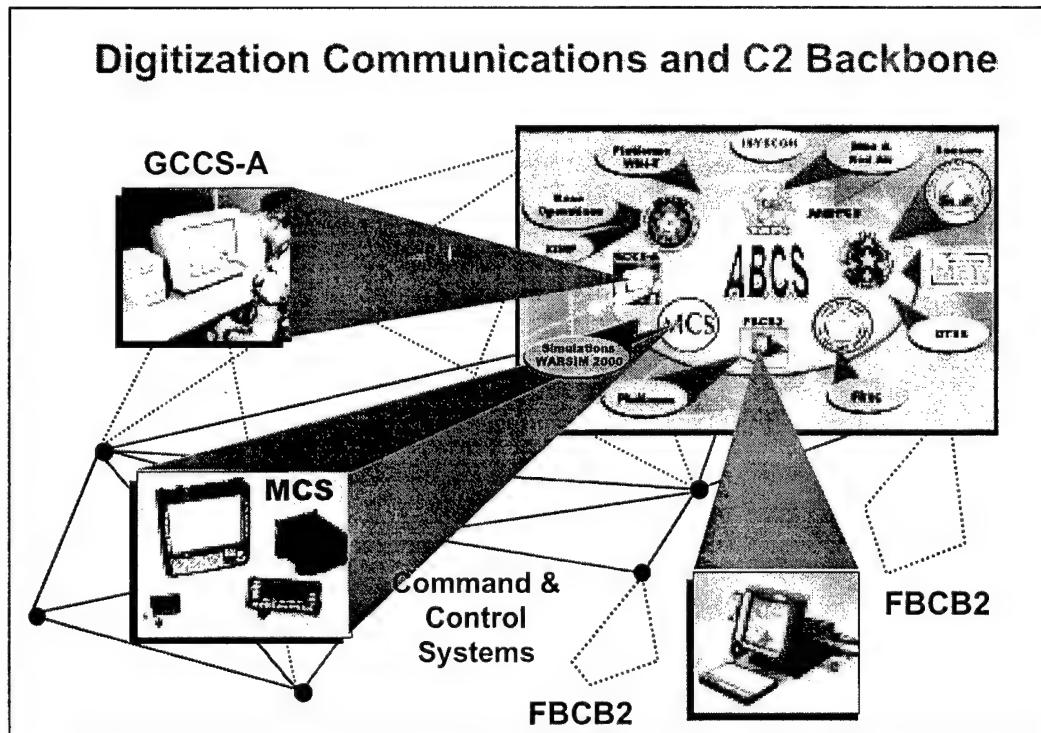


Figure A-2
Digitization Backbone

- Combat Service Support Control System (CSSCS).
- ◆ Force XXI Battle Command Brigade and Below (FBCB2) hardware and software which provides enhanced situational awareness down to the individual platform level.

FBCB2 is a key component of the ABCS and consists of computer hardware and software integrated as an appliqué to fighting vehicles or critical support vehicles. When the software is embedded in the computers of combat vehicles, it is known as Embedded Battle Command or EBC. FBCB2 and EBC provide on-the-move, near-real-time situational information, a common picture of the battlefield, the locations of enemy and friendly forces and the rapid exchange of information and orders.

Together, these systems provide a common operating picture (COP) of the battlefield, including friendly and enemy locations, as well as maneuver control measures. For a heavy division to be considered "digitized," it must be equipped, as a minimum, with these basic systems, as well as digitized weapons platforms, including M1A2SEP and M1A1D Abrams tanks, and M2A3 and M2A2ODS Bradley Infantry Fighting Vehicles.

Category 2 systems enhance the digital capabilities noted above, and include the weapons platforms, sensors, combat support and combat service support systems. These systems provide additional capabilities to the commander and enrich the common operating picture that results from the hundreds of sources of tactical data. Category 2 systems provide:

- ◆ Digitally enhanced weapons platforms, sensors, and support systems;
- ◆ Systems digitally connected across the battlefield to ABCS, providing commanders, staffs, and individual soldiers with:
 - Enhanced situational awareness;
 - Ability to digitally send and receive orders; and,
 - Logistics management (Total Asset Visibility and Battlefield Distribution).

First Digitized Division

The 4th ID is an armored division with two armored brigades at Fort Hood, Texas and a mechanized infantry brigade at Fort Carson, Colorado. The Fort Hood, Texas units will be equipped by the end of 2000 with required Category 1 systems, including the critical C2 systems from each battlefield operating system (BOS), as well as the majority of the Category 2 systems. The remaining available new digital systems will *enhance* division capabilities but are not deemed necessary to demonstrate an initial digitized capability; however, the 4th ID will receive the remaining available systems between 2001 and 2004, and the third brigade at Fort Carson will be fielded by 2004. Once it is digitized, the 4th ID will be able to take advantage of increased situational awareness to dramatically improve the synergy of the combined arms team.

The 4th ID was the first division to reorganize according to the new Army XXI Division design, discussed in greater detail later in this annex. The restructured division has a deployed footprint approximately 25 percent smaller than an Army of Excellence division. Armored brigades of the 4th ID have two armored

battalions and one mechanized; the mechanized brigade has two mechanized battalions and one armored. Each armored battalion is equipped with 44 Abrams tanks (M1A1D or M1A2 SEP), while each mechanized battalion has 44 Bradleys (compared to 58 M1A1 Abrams and 58 Bradleys, respectively, in today's battalions).

Currently, the 4th ID is undergoing the second phase of the transition: Modernization. By the end of 2000, it will be equipped with critical digital command, control and communications systems, and most digital sensors and weapons platforms. It will receive a combination of weapon and support platforms with embedded or appliquéd digitization, because fiscal and production constraints prohibit purchase of required quantities of weapons platforms with embedded battle command. Units receiving appliquéd will have FBCB2 installed in their M1A1s and M2/M3A2s to provide a digital communications and C2 system, whereas the M1A2SEP and M2A3 will have Embedded Battle Command (EBC).

The FDD will mark the fielding of an interim capability in the modernization of the heavy division. Meanwhile, other Army divisions are also adopting the Army Division XXI structure. These smaller organizations must also be able to take advantage of the increased agility, lethality and survivability provided by Digitization. The major difference between the FDD and subsequent heavy objective digitized divisions (ODD) is the number and degree of Category 2 fielded systems. Subsequent ODDs will be equipped with all Category 2 systems that have been fielded.

The procurement (PAA-Procurement Appropriations Army) cost of the remaining digital equipment being fielded to the 4th ID is estimated to be \$332.1 million during fiscal years 2000-2005. Programs like the M1A1 tank and M2A2 Bradley include only the cost of integrating digital technologies onto the platforms.

In the past, systems were fielded individually as they became available. Since many of the modernized and digitized systems operate synergistically with other systems, the Army is adjusting individual system fielding schedules to field by brigade sets. This will provide our divisions with brigade combat teams that have full digital combat fighting capabilities. Brigade Set Fielding is discussed in greater detail in Annex C.

First Digitized Corps

III Corps, also located at Fort Hood, will become the First Digitized Corps (FDC) by the end of 2004. III Corps consists of the 4th ID, the 1st Cavalry Division (1st Cav), the 3rd Armored Cavalry Regiment (3rd ACR), III Corps headquarters, and appropriate Corps troops (Active Component and Reserve Component). III Corps will be equipped with the most modern of available armored systems, such as those shown in Figure A-3. 1st Cav will be digitized by the end of 2003 with three embedded maneuver brigades. The 3rd ACR will be digitized by the end of fiscal year 2004 with appliquéd. The Army intends to field embedded tank and Bradley Fighting Vehicles to the 3rd ACR as soon as they are available (2005-2006).

	M1A2 SEP	M2A3	M3A3	M7A1	HERCULES	CRUSADER
III Corps	0	0	0	0	16	0
4ID	253	180	43	31	50	57
1Cav	253	180	43	31	46	57
3ACR	129	0	131	12	18	19

Figure A-3
III Corps Systems

Reserve Component Digitization

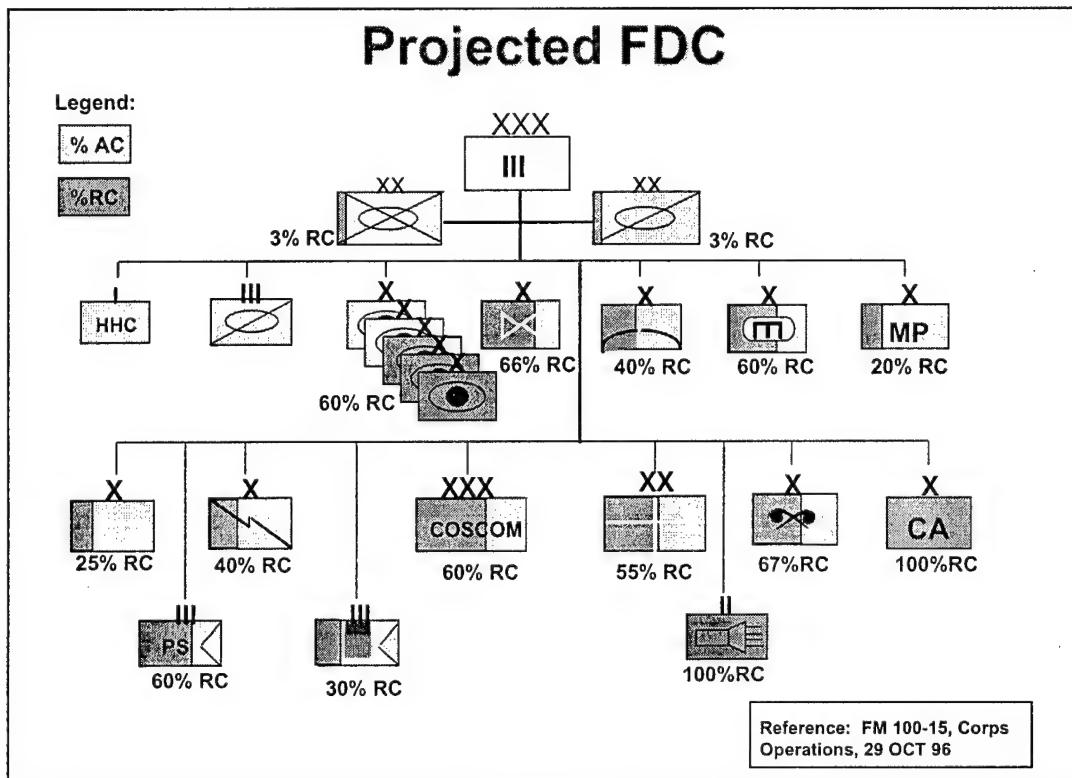
Digitization of the Reserve Component (RC) is an integral part of the Army digitization program. Army National Guard (ARNG) and U.S. Army Reserve (USAR) units are on the current fielding plans for nearly all of the Category 1 digital systems, most notably the five Army Tactical Command and Control Systems (ATCCS), SINCGARS-ASIP radios and the upgraded ACUS MOD (MSE).

The Army approved the Corps Troop List for the FDC in 1999, allowing the Army to refine the resourcing of the digital requirements of the RC units. RC digitization will begin with the RC elements in the 4th ID, including the Division Rear Operations Center (ROC), and a Multiple Launch Rocket System (MLRS) battery. An MLRS battalion, from the 49th Armored Division, ARNG, will provide one dual-missioned battery each to the division MLRS battalions of the 4th ID, 1st Cavalry, and 3rd ID, and a General Support Aviation Company. Current plans call for fielding the applicable Category 1 systems to RC units aligned with III Corps by the end of fiscal year 2004 and Category 2 systems in accordance with

DAMPL sequence. RC units of the FDC will be digitized from platform level (depending on the type of unit) to brigade headquarters with emphasis on the systems that provide C2 and CSS connectivity for both AC and RC with higher headquarters (Figure A-4).

ARMY DIVISION XXI OVERVIEW

The redesign of the Army of Excellence (AOE) division to the Army XXI division results in a smaller, more flexible combined arms force optimized to conduct offensive operations. This division will have fewer combat systems than the AOE division and a decreased logistics footprint, making it more deployable. Within the division structure will be embedded 515 Reserve Component (RC) soldiers, most of them slotted into individual table of organization & equipment (TO&E) positions. In some instances, (General Support Aviation Company, and MLRS Battery) complete units will be provided from the RC. Organized around information, this division will be able to dominate a much larger battlespace, and control the battlefield tempo with overwhelming lethality and superior survivability. Because of its increased capabilities, this



Annex A-4
Projected RC Participation

division can also be deployed as an operational or strategic force, if provided augmentation from corps and echelons above corps.

Key Elements of Division XXI Redesign

The Army XXI Division is knowledge and capabilities-based versus the Cold War era Army of Excellence (AOE) division that was threat-based. This design facilitates effective packaging of Army forces for contingency operations by permitting a better mix of both mission and support organizations based on theater and contingency missions. Where AOE divisions relied on massing combat power to achieve success in the close fight, Division XXI relies on massing effects to achieve overwhelming success

throughout the depth of the battlespace. Information dominance is achieved through situational understanding and a common relevant picture of the battlespace.

The new Army Division XXI division will have a personnel structure that includes 15,815 soldiers for the Mechanized Division Variant (15,300 AC, 515 RC). The current AOE Standard Heavy Division, has a manpower structure of 18,632 soldiers for the Mechanized Variant. (Figure A-5).

This design appears to be the right solution for optimizing Army XXI operations. Design changes capitalize on the good points found in the AOE division and from the insights gained through

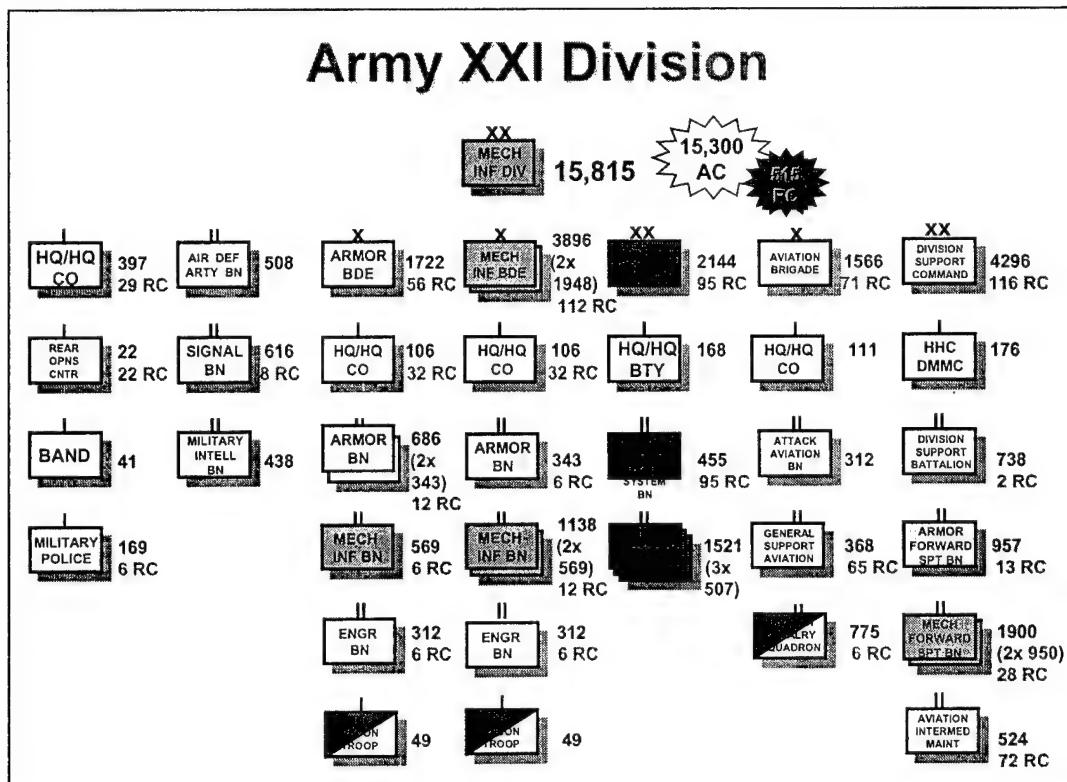


Figure A-5
Army XXI Division

experimentation (Figure A-6). The key division design change elements include:

- ◆ An area of operations increased by up to 240 percent, to 120 kilometer frontage by 200 kilometer depth;
- ◆ A battlefield framework based on distributed operations on a non-linear battlefield;
- ◆ Increased operational tempo and survivability that makes the division capable of defeating an enemy force approximately three times what an AOE division could defeat; and,
- ◆ A distribution-based sustainment system that is much more responsive to the needs of the warfighters.

AOE to Division XXI Comparison: Net Assessment

An overview by Battlefield Operating System (BOS) highlights many of the major changes between AOE and Army XXI.

The Army XXI Division in its operational environment is multidimensional, capable of operating in an extended battlespace that includes the electromagnetic spectrum, as well as physical dimensions of width, depth, and height. It extends beyond the physical boundaries of the division through its communications and digital connectivity to other Army, joint, and coalition elements, and even reaches back to the continental United States.

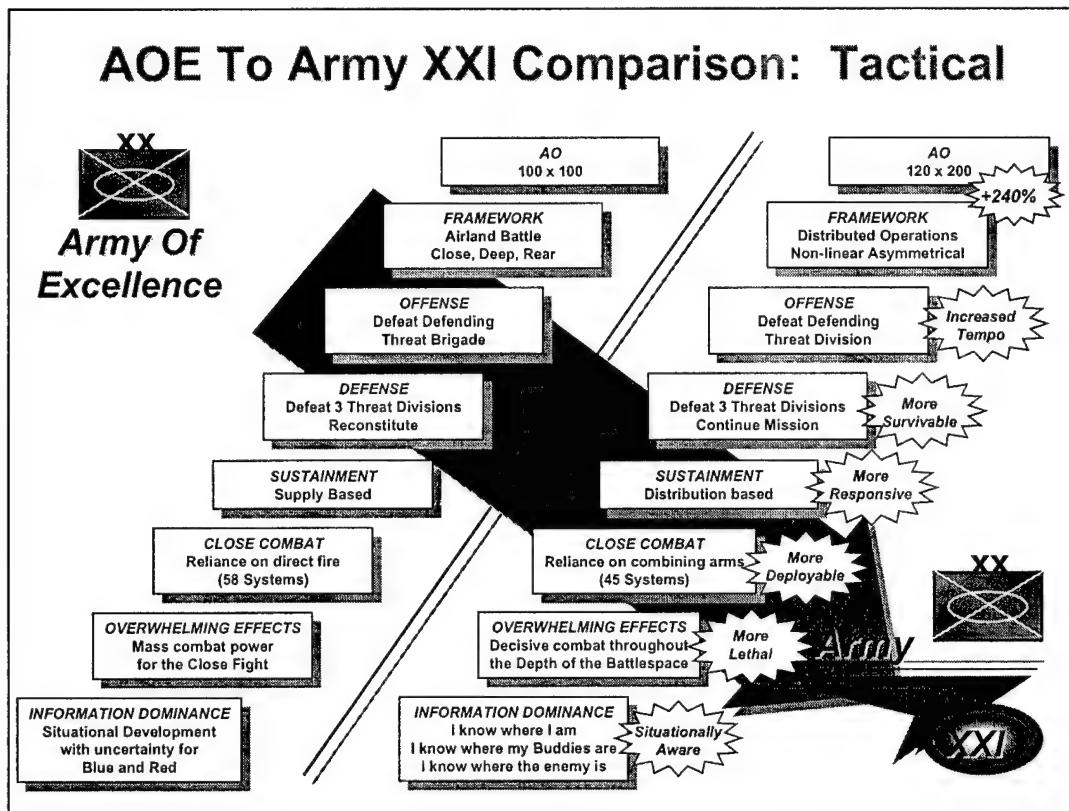


Figure A-6
Comparison of AOE and Army XXI

The Army XXI Division will conduct precision operations that go beyond precision strike to include every aspect of military operations from deployment through combat and redeployment or transition to other operations. Precision in decisive operations is enabled by three emerging capabilities. First, digitization provides soldiers and leaders at each echelon the information required for making decisions. Second, a full suite of strategic, operational, and tactical sensors linked to analytical teams fuses combat information into situational understanding across the battlespace. Lastly, simulations enable Army elements to be tailored and operations planned, wargamed and rehearsed—yielding precision execution.

The Army XXI Division will conduct nonlinear operations that do not seek the traditional battlespace grid of close, deep, and rear operations. Instead, the battlespace is fluid, changing as mission, enemy, troops, terrain, and time available (METT-T) change through the duration of mission preparation and execution. Another dimension of this characteristic is the synchronization of near-simultaneous operations to achieve nonlinear effects across the battlespace.

Army XXI Division operations are distributed or executed where and when required to achieve decisive effects concentrated at a decisive point. Dispersion empowers subordinates to operate independently within the

commander's intent, leading to synergistic effects that exceed the effects of a centralized headquarters.

The Army XXI Division conducts simultaneous operations across the battlespace. Simultaneous operations seize the initiative and present the enemy leadership with multiple crises and no effective response. Rather than a single, concentrated attack, the division executes a series of attacks (lethal and nonlethal) as simultaneously as possible.

Army XXI Division operations are fully integrated with joint, multinational, and non-governmental partners. Integrated operations enable the Army to leverage the full suite of capabilities the Services bring to the battlespace.

The Army Division XXI Command and Control BOS will:

- ◆ Have increased battlespace;
- ◆ Collocate Rear and Main Command Posts;
- ◆ Have mobile command and control;
- ◆ Conduct signal planning in Division G6; and,
- ◆ Add Information Operations Cell.

The Army Division XXI Maneuver BOS will:

- ◆ Have 44 platforms per battalion (3 companies per battalion);
- ◆ Add a Brigade Reconnaissance Troop (BRT) to each maneuver brigade;
- ◆ Have a standardized mortar organization (4 per battalion);

- ◆ Reduce and standardize battalion scouts; and,
- ◆ Have centralized CSS.

The Army Division XXI Fire Support BOS will:

- ◆ Eliminate fire support team (FIST) below company level;
- ◆ Create Striker, placed in Brigade Reconnaissance Troop;
- ◆ Create MLRS/Target Acquisition Battalion;
- ◆ Downsize Paladin crew from 9 to 8; and,
- ◆ Be optimized for improved weapons/munitions.

The Army Division XXI Mobility, Countermobility, Survivability BOS will:

- ◆ Eliminate the Engineer Brigade command and control;
- ◆ Add an Engineer planning cell to division staff;
- ◆ Streamline the Engineer Headquarters & Headquarters Company;
- ◆ Redesign the Engineer Company;
- ◆ Have NBC reconnaissance in the Division Cavalry Squadron; and,
- ◆ Have centralized combat service support (CSS).

The Army Division XXI Air Defense Artillery BOS will:

- ◆ Implement Short Range Air Defense (SHORAD) system of systems; and,

Remove Man-Portable Air Defense System (MANPADS).

The Army Division XXI Intelligence BOS will:

- ◆ Add additional Analysis and Control Team (ACT) Enclave for Aviation or Division Artillery use;
- ◆ Increase S2 (intelligence personnel) strength in Aviation and Division Cavalry Squadron; and,
- ◆ Increase connectivity with Echelons Above Division (EAD).

The Army Division XXI Combat Service Support (CSS) BOS will:

- ◆ Centralize CSS for maneuver and engineer units;
- ◆ Have a distribution-based supply system;
- ◆ Have reduced stocks;
- ◆ Have self-sustaining capabilities for a limited period;
- ◆ Have passbacks to Corps of some functions; other functions passed to organic RC assets; and,
- ◆ Implement enablers, multifunction mechanics, and Forward Repair System-Heavy (FRS-H).

Army XXI Division Summary

The Army XXI division design marks the first steps toward a seamless, integrated force in the future—one in which active and reserve soldiers serve side-by-side making their unique contributions to Army operations. Warfighting benefits include enhanced sensor to shooter linkages that improve lethality, situational understanding that increases survivability and tempo, and centralized logistics that allow efficiency of operation and reduced stockages. The goal is to exploit

information age capabilities to significantly enhance the 21st century force's capabilities in terms of survivability, lethality, operational tempo, sustainability, deployability, versatility, and Joint/Combined linkages. We are moving to that future now.

Providing digital capability to the remainder of the force will be dependent on availability of funding as we move past fiscal year 2004. Following the digitization of the divisions, the Army will ensure that the Corps elements that support these divisions are also modernized with the same information technologies to support effective command and control of the force. Included in this plan are digital capabilities for Reserve Components, Army Prepositioned Stocks, digital equipment for the Army's training centers and the training base.

CORPS REDESIGN OVERVIEW

In June 1998 the Commanding General, Training and Doctrine Command (CG, TRADOC) initiated the Road to the Force XXI Corps redesign. The purpose of the redesign effort is to develop an organizational and doctrinal concept and design for the contingency corps, optimized for mid-intensity combat operations. The effort will initially focus on III Corps in developing the standard design as a follow-on to the design effort of the heavy division. This effort will focus on determining the core competencies of Corps level operations, as well as to determine force allocation rules and structure for combat, combat support, and combat service support for tactical tailoring force packages for contingency operations at the mid-intensity conflict spectrum.

The Corps Redesign process will weave core competencies into organizational, operational, and doctrinal capabilities. New Information Age technologies will allow for seamless interoperability of all C4ISR systems; more efficient strategic air and sea lift to support and sustain distributed operations; intelligence platforms that are linked directly to shooter platforms; sustainment and tactical concepts that are linked at the hip; and staffs that have high proficiency in Army and Joint operations. The Corps Redesign process will develop the 21st century Corps that can fight and win tomorrow's wars.

The end-state is to design a force that can perform the following functions:

- ◆ Provide a contingency corps, deployable to mid-intensity operations, capable of executing the Force XXI patterns of operation;
- ◆ Function as a Joint Task Force (JTF), Joint Forces Land Component Commander (JFLCC), Army Forces (ARFOR) or Corps Headquarters with augmentation, and as such, must accommodate joint and combined interoperability considerations;
- ◆ Provide heavy force packages and other supporting arms to other contingency force headquarters, as well as to command and support light forces;
- ◆ Conduct entry operations at the strategic and operational level for permissive and semi-permissive environments;
- ◆ Support a distribution-based logistics system and maximize throughput to using units;

- ◆ Retain and include the dominant essential characteristics of being deployable, modular, expandable, tailorable, and utilize split-based operations with CONUS for reach-back support and sustainment; and
- ◆ Optimize for mid-intensity operations. Force allocation rules for Combat Support (CS) and Combat Service Support (CSS) must be optimized to enhance interdependence, versus the redundancy inherent in combined arms organizations.

The redesign effort will also identify changes to Echelon Above Division (EAD) doctrine, organizations, and associated allocation rules in light of Force XXI concepts.

Annex B

Army Experimentation

Warfighting experiments are the heart of the Army's warfighting requirements determination process... (They) provide the Army an unsurpassed means to understand future warfighting requirements... warfighting experiments open "windows to the future." Understanding the costs and benefits of change across the force and in all domains allows us to "maintain the edge" and conserve resources at the same time

The Transformation Vision has not ended or reduced the need for experimentation. It has shifted the experimental focus toward achieving the future operational capabilities desired in the Objective Force while, at the same time, maintaining our position as the world's most dominant land force. Experimentation gives us the insights necessary to make investment decisions that enable us to retain today's decisiveness through selected modernization and digitization enhancements to the mechanized and light forces, while providing the science and technology with specific guidance.

The Army Experimentation Campaign Plan (AECP) capitalizes on successes of the Task Force XXI and Division Advanced Warfighting Experiments (AWE) to develop future warfighting capabilities needed to respond to new challenges and requirements. Currently, experimentation is proceeding on two axes (Mechanized and Light) leading to a strategically responsive force that is dominant across the full spectrum of operations. Insights from both axes will be leveraged to advance the implementation of the new Army Vision. The Army's primary challenge is to fully integrate the AECP into the Joint experimentation domain while maintaining the focus of the demands of the transformation.

The AECP is work in progress. It evolves each year to support new discoveries in

experimentation and new changes in Army and Joint experimentation methodology. It is the principal tool we use to adapt our force to meet the challenges of modern conflict. We use it to identify and incorporate the most promising warfighting enablers so that we can field an Army able to generate extraordinary force, and apply it with such precision, at such a tempo that the enemy has no effective counter. Only by encompassing change will the AECP be able to adapt itself to the Army's future requirements as it supports the new Army transformation vision. As long as we stay focused on the Force XXI process, we will be able to harness information-age capabilities and advance into the 21st Century with the most capable combat force in the world.

The AECP examines experimental hypotheses proposing that U.S. forces enabled with information-based command and control, advances in training and leader development, technology enhancements and joint interoperability will realize significant improvements in warfighting capability and strategic responsiveness. The AECP supports transformation strategy goals of enhancing the capabilities of the Objective Force by combining the integration of information technologies with advanced science and technology still under development. Experimentation funding, previously devoted exclusively to mechanized AWE's and developmental

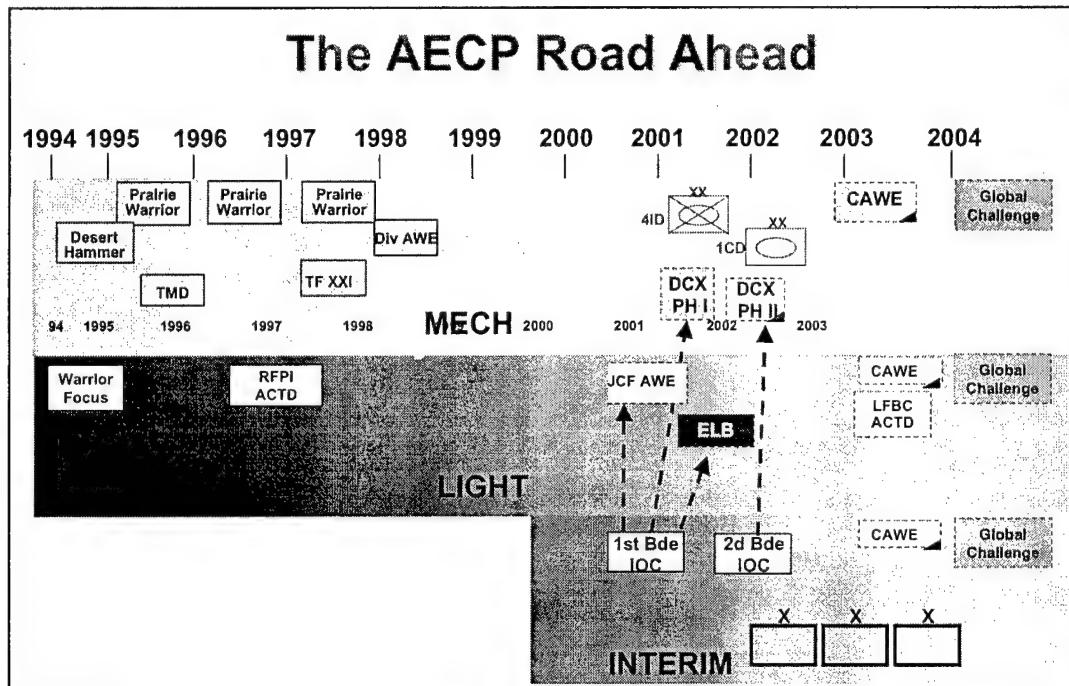


Figure B-1
The AECP Road Ahead

work, is now directed against the Light axis, while fielding and exercises are occurring on the Mechanized Force axis.

The AECP has two objectives: Service competence, fielding the most powerful land force in the world; and joint competence, integrating Army forces into the joint team. The Army continues to pursue efforts with the other Services (and allies) to ensure interoperability and seamless communications throughout the battlespace. In fiscal year 2000, 20 percent of those dollars associated with the AECP are related to joint experiments. It centers on two principal concepts:

- ◆ AWEs—which allow us to assess the relative worth of proposed technologies and other enablers when used by soldiers in relevant, tactically demanding scenarios; and,

- ◆ Integrated and simultaneous development—the partnership between scientists, industry, soldiers, the research and development community, and testing agencies that allows us to anticipate and leverage change in an integrated fashion, versus a sequential approach.

Lessons learned from AECP efforts will help the Army develop a vibrant capability for reach back communications and intelligence so that we can begin to aggressively reduce the size of our deployed support footprints—both combat support and combat service support. This will provide our divisions the agility and the versatility to transition rapidly from one point on the spectrum to another with minimum loss of momentum, enabling them to dominate across the full spectrum of operations (Figure B-1).

AWEs AND THE MECHANIZED AXIS

While developing and executing experiments with mechanized contingency forces, which culminated in the Task Force XXI Army Warfighting Experiment (AWE) and the Division AWE (DAWE), the Army came to the conclusion that experimentation with future force technologies in the near-term would not end with these events (Figure B-2).

As a result of those experiments, we were able to accomplish two major objectives. First, we were able to build mechanized and armored formations that are more lethal, deployable, and sustainable than anything previously fielded. This effort allowed us to reduce the number of heavy

combat systems—tanks, Bradley Fighting Vehicles, and artillery—by 25 percent. Second, and more importantly, rigorous, demanding, robust experimentation, enabled us to make crucial strategic decisions about building today's and tomorrow's Army to meet the obligation to field a force that is organized, trained, and equipped to conduct prompt and sustained combat operations on land. This includes the so-called Legacy Mechanized and Light Forces, as well as, Interim Force, Initial Brigade Combat Teams, and the Objective Force.

The Force XXI process, therefore, became not an end state, but another venue for us as we redesign our operational forces for the 21st Century.

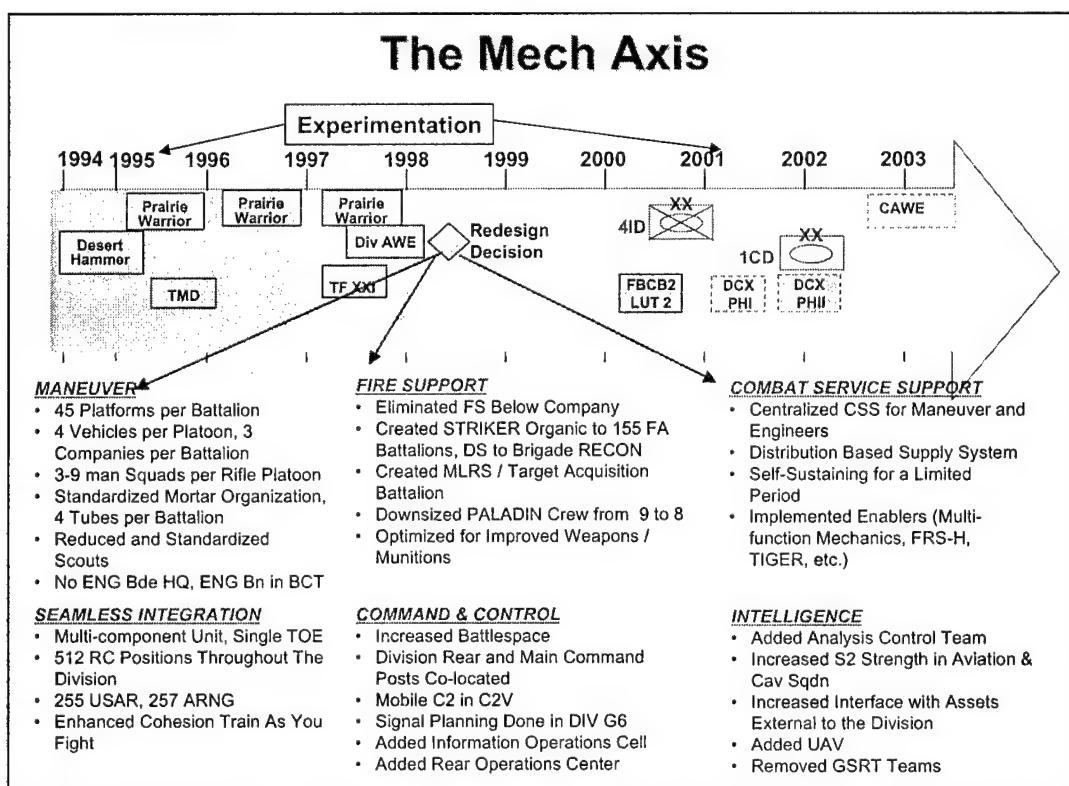


Figure B-2
Mechanized Axis Experimentation

AWEs have served not only to put new concepts to the most rigorous tests possible, short of actual combat, but also to serve as "forcing functions," to synchronize and bring to fruition all the complex pieces of the digital force in one place at one time. The Army has seen remarkable progress as a result. Technical obstacles that were initially declared to be insurmountable problems were frequently solved in a matter of weeks and sometimes days, accomplishments that would have taken years in the traditional requirements determination model. The Mechanized axis continues to build on the accomplishments of AWEs and other events to digitize mechanized and armored forces. Mechanized force

experimentation will enhance the overmatching combat power of our heavy divisions, characterized by information dominance, improved mobility, survivability and lethality in an expanded battlespace. For example, the 4th Infantry Division, equipped as the First Digitized Division (FDD) by the end of fiscal year 2000, will conduct a Division Capstone Exercise (DCX) in the 2nd and 4th quarters of fiscal year 2001.

DIVISION CAPSTONE EXERCISE

The 4th ID has been the mechanized Experimental Force (EXFOR) and serves as the Army's experimental unit for new ideas and the testing of information age technology (Figure B-3). As the Army's

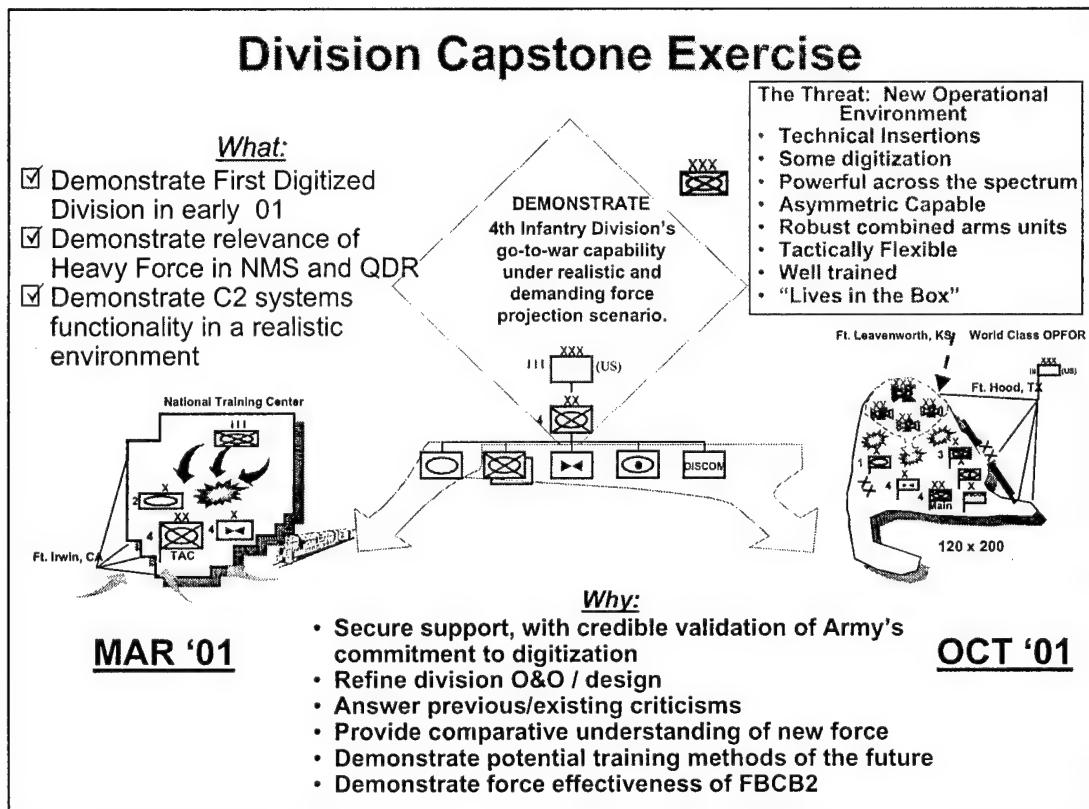


Figure B-3
Division Capstone Exercise

First Digitized Division, it will take advantage of increased situational understanding to dramatically improve synergy of the combined arms team.

The CSA directed that a culminating digital training event, the DCX, be developed for the FDD. The DCX will demonstrate the 4th Infantry Division's warfighting capability with fielded systems in 2001 using current Organizational and Operational (O&O) concepts. The event will also assess the progress in meeting the Doctrine, Training Leader Development, Organization, Materiel, and Soldiers (DTLOMS) of the FDD since the DAWE, in both a tactical and simulated environment.

The DCX will assist the Army in assessing current go-to-war status with O&O concepts under Mission Equipment Terrain Troops-Time (METT-T) conditions. In the DCX, the 4th ID will conduct a full range of stability and support operations in a joint and multinational environment, and conduct distributed operations using maneuver and firepower, facilitated by information dominance, to destroy enemy forces and to seize and retain ground. The primary focus of DCX will be unit training, based on existing fielding and minimal joint experimentation.

ELEMENTS OF THE DIVISION CAPSTONE EXERCISE

The DCX is a 4th ID training event demonstrating go-to-war capabilities with systems fielded by January 2001. The DCX will be executed in two phases. The first phase will be a National Training Center rotation in April 2001 with the 2nd Brigade Combat Team, and the 4th ID Tactical Operations Center (TOC)

deployed at the NTC. The second phase will be a warfighter exercise utilizing Corps Battlefield Simulation (CBS) and Combat Service Support Training Simulation System (CSSTSS) as the simulation exercise drivers, with the appropriate Battle Command Training Program (BCTP) representation at Fort Hood during October 2001. TRADOC objectives for the DCX include refining DTLOMS, increasing the maturity of C4ISR/BC capabilities, improving Joint participation, and refining CSS concepts.

III Corps and 4th ID Training Objectives

Training objectives for the DCX are to:

- ◆ Demonstrate the capabilities of the Army's first digitized division in as realistic a training environment as possible;
- ◆ Validate the Digital Division Training Strategy;
- ◆ Demonstrate the ability to train the division in live and constructive environments; Maximize the capabilities of existing training simulation; and,
- ◆ Verify the seamless interface of all components of the Army Battle Command Systems (ABCS).

The DCX is a complicated effort, and the Army has revised the original plan to account for technical, training, and fielding challenges. The revised strategy is executable, but the Army has accepted some risk due to limited scheduling flexibility (Figure B-4). Several issues with regard to conduct and objectives of the DCX will require consideration and resolution during the DCX planning stages:

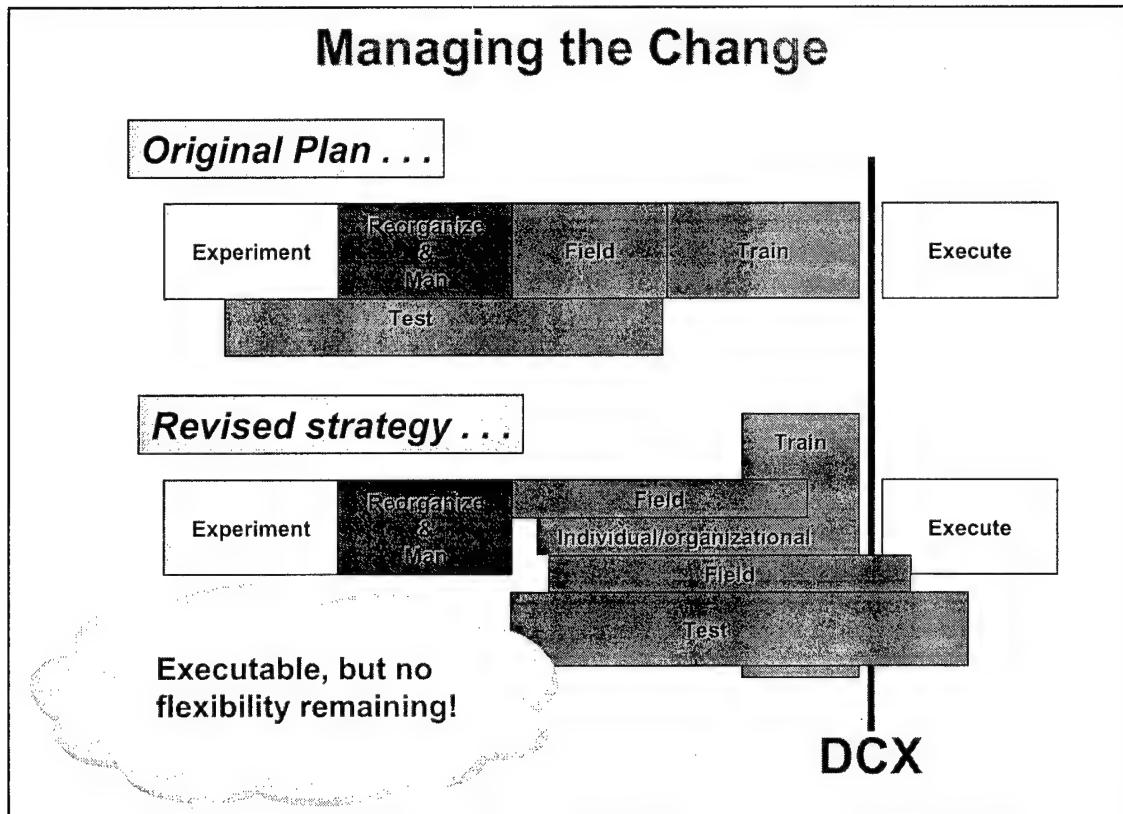


Figure B-4
Managing the Change

- ◆ The modernization level of 4th ID for the exercise is based on systems fielded in 4th ID, or that would be fielded in the Army and predictably available to 4th ID upon deployment.
- ◆ The simulation architecture represents the best mix of systems expected to be available. Development of simulation models, specifically OneSAF Testbed, may drive execution of various Army branch decisions in the future. Also considered will be a leave-behind training capability.
- ◆ Joint participation will be minimized to ensure unit training objectives are achieved. Joint objectives with minimal impact on unit training objectives will be considered.

- ◆ The DCX will require maximized RC participation, particularly for individuals and units in the division structure and for corps level supporting units that participated in the Division Advanced Warfighter Experiment (DAWE).

The near-term focus for the DCX includes:

- ◆ Testing, fielding and training on Category 1 and selected Category 2 systems;
- ◆ Developing DCX timelines to integrate Army, unit, and TRADOC objectives;
- ◆ Translating Division O&O concepts into tasks, conditions, and standards;

- ◆ Developing the threat, road to war, and scenario to be supported by a robust training environment
- ◆ Developing DCX-specific Operational and Systems Architecture requirements, and Simulation requirements
- ◆ Developing and fielding new doctrinal manuals, Mission Training Plans (MTPs), and Training Support Plans (TSPs)

The successful completion of the DCX will demonstrate the division warfighting capability across the DTLOMS. This event will maximize the capabilities of existing training simulation technology to provide those enablers which allow the FDD to fully test and train the Division XXI concept. At the time of the DCX, the FDD should be capable of meeting Army patterns of operation of projecting and protecting the force, gaining information dominance, shaping the battlespace,

conducting decisive operation and sustaining and transitioning to future operations. The integration of the DTLOMS domains and the power of computer and information age technology set the conditions for meeting the needs of the 21st Century Force.

CORPS ADVANCED WARFIGHTING EXPERIMENT

The Corps Advanced Warfighting Experiment (CAWE) is scheduled to be conducted concurrently with the III Corps Warfighter in December 2002. It will be a constructive simulation exercise conducted to experiment with digitization and the resulting ramifications for operations at the Corps level. The CAWE will be used to determine the capability of a Corps XXI to dominate expanded battlespace and simultaneous operational environments. Additionally, it will investigate the relevance of C2 packages

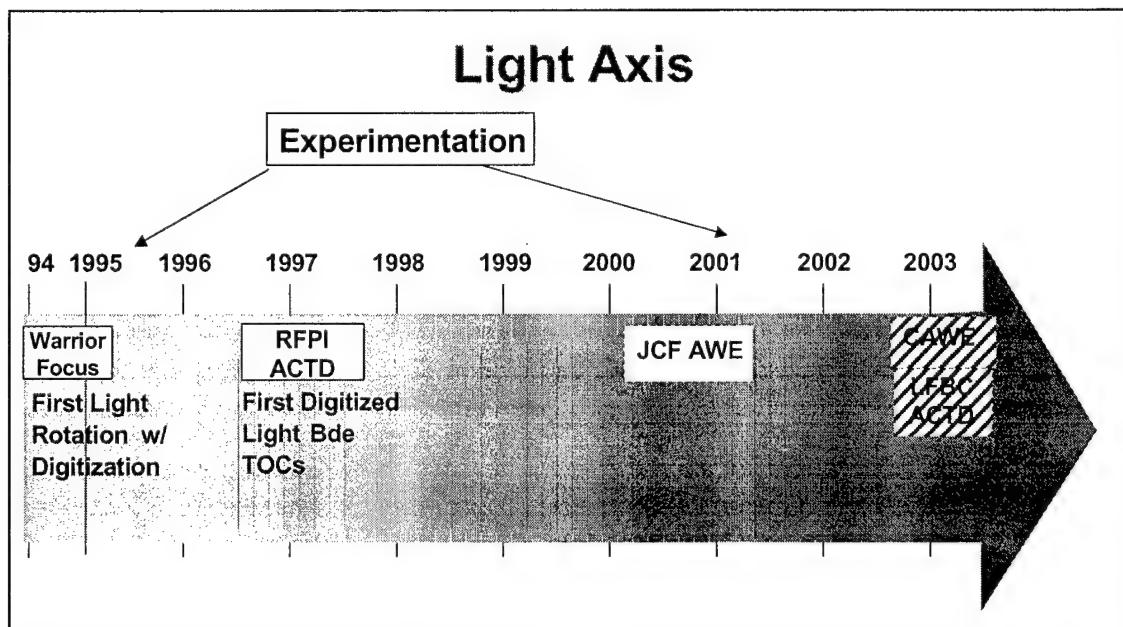


Figure B-5
Light Axis Experimentation

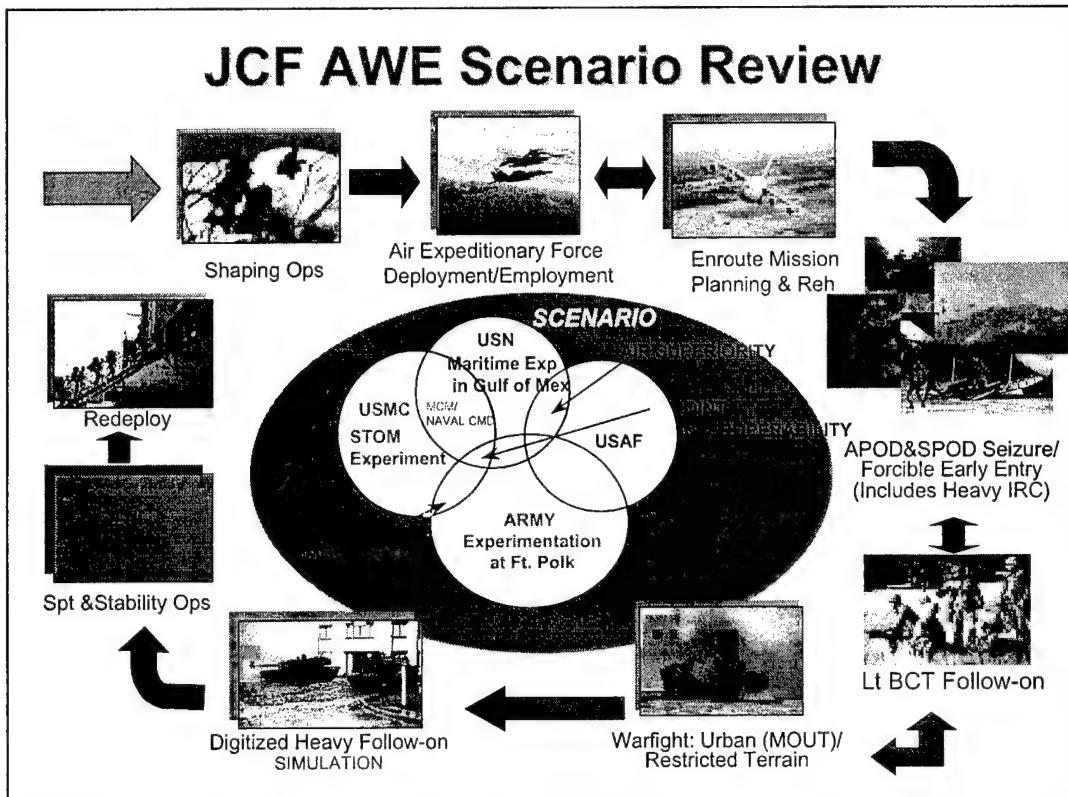


Figure B-6
JCF AWE

required early, which would allow more relevant forces to arrive in theater sooner. Lastly, it will incorporate individual contributions of other services in selected portions of the battlespace. An expected result of the CAWE is the ability to finalize the Corps Operational and Organizational design and to lay the groundwork for transitioning doctrine and tactics to future operational environments.

LIGHT AXIS

As part of the Army's commitment to success across the spectrum of conflict, the Army is applying lessons learned from heavy axis experimentation to light forces (Figure B-5). The light force axis aims to achieve increases in the lethality, survivability, mobility, and the operational

tempo of light forces by providing situational awareness improvements comparable to the enhancements made to heavy forces

The Light Axis includes premier forced entry capable units that can operate in urban and complex terrain, as part of a joint task force (JTF). The XVIII Airborne Corps will fill the role of a joint task force tactical headquarters for command and control.

Joint Contingency Force AWE

The key event of the Light axis is the Joint Contingency Force (JCF) AWE, which will occur in September 2000. The Army elements of the AWE will consist of a brigade-sized element from the 10th

Mountain Division. Also participating will be assets from the U.S. Navy, U.S. Marine Corps, U.S. Air Force, and Special Operations Forces. U.S. Joint Forces Command (JFCOM) has embraced this series of service experiments as its inaugural joint experimentation opportunity under the "umbrella" title of "Millennium Challenge 00" (Figure B-6).

The JCF AWE is a culminating experiment that supports JV2010 and Army Vision operational concepts of dominant maneuver, precision engagement, focused logistics, and full dimensional protection. Since JFCOM embraced the JCF AWE as a major initial event in the Joint Experimentation Campaign Plan, it has taken on greater significance. It will loosely integrate distinct Service experiments through a common scenario and mutual operational interoperability opportunities. It focuses on brigade and below light contingency forces conducting operations in urban and restrictive terrain. JCF AWE objectives are written from a Joint Vision 2010 perspective. It has three overarching objectives:

- ◆ Determine how digital systems/linkages improve joint command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) effectiveness and efficiency through digitization, enhanced communications, and joint interoperability of systems and processes
- ◆ Determine how digital systems/linkages enhance the ability of joint contingency forces to execute operations in urban and restrictive terrain, and
- ◆ Determine how digital systems/linkages enhance the ability of joint contingency forces to plan and execute early entry operations.

The JCF AWE will also serve as a venue for joint experimentation with JFCOMs joint experimentation process. This venue will provide for the coexistence of training and experimentation and will bring together the combined efforts of users, testers and materiel developers.

Annex C

Army Brigade Set Fielding

Numerous digitized and non-digitized systems are being fielded to all units simultaneously, including the Transformation Brigades, to provide enhanced operational capabilities and situational understanding for all levels of command. Digitized modernization will impact every soldier, unit and support organization on the modern battlefield and significantly improve tactical command and control and timely decision-making. On 18 December 1998 the Chief of Staff of the Army approved the fielding of modernization equipment "sets" by installation and Brigade/Brigade Combat Teams to train and equip units and return them to maximum warfighting capability in the shortest time possible. This concept

evolved into the Brigade Set Fielding (BSF) process (Figure C-1).

BSF modernizes the force through a "System of Systems" fielding approach based on total organization capability rather than individual systems. The goal is to ensure that a unit completes the transition from an Army Of Excellence (AOE) to an Army XXI organization or Interim Brigade in the shortest possible time with minimum risk to operational availability. BSF extends and coordinates the Total Package Fielding (TPF) process. TPF will continue as a key subset of BSF; however, since multiple systems are being fielded and numerous PEOs/PMs are conducting TPFs simultaneously, BSF

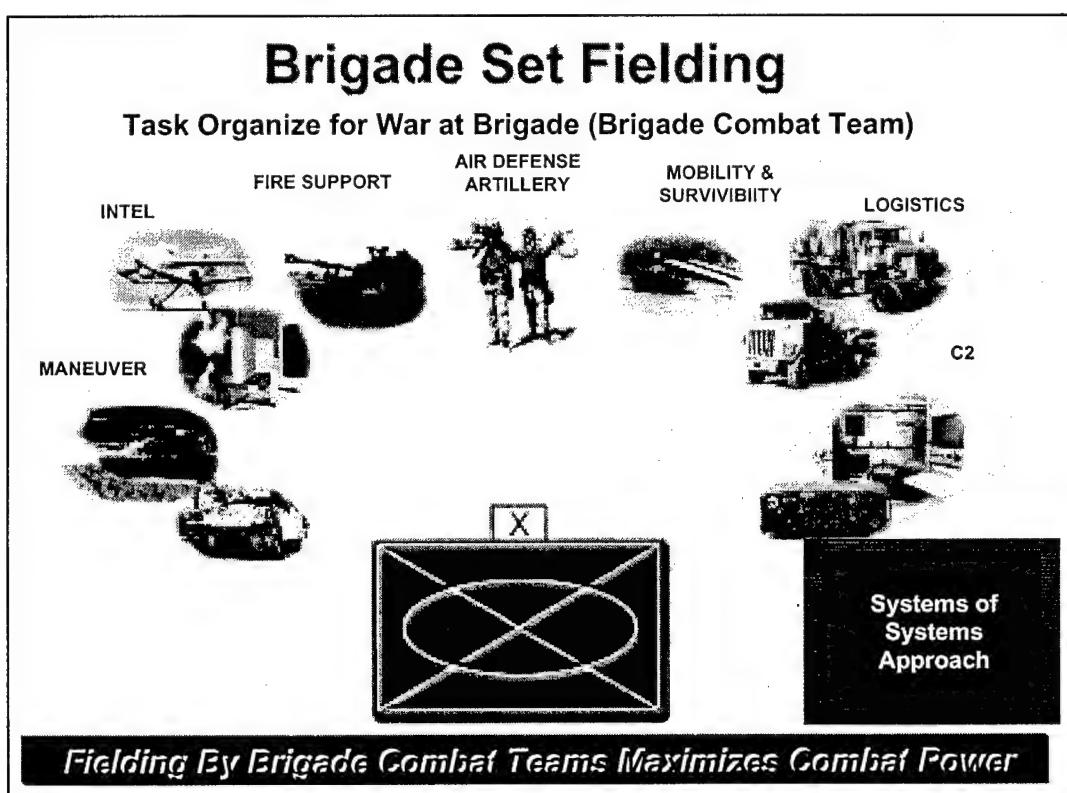


Figure C-1
Brigade Set Fielding

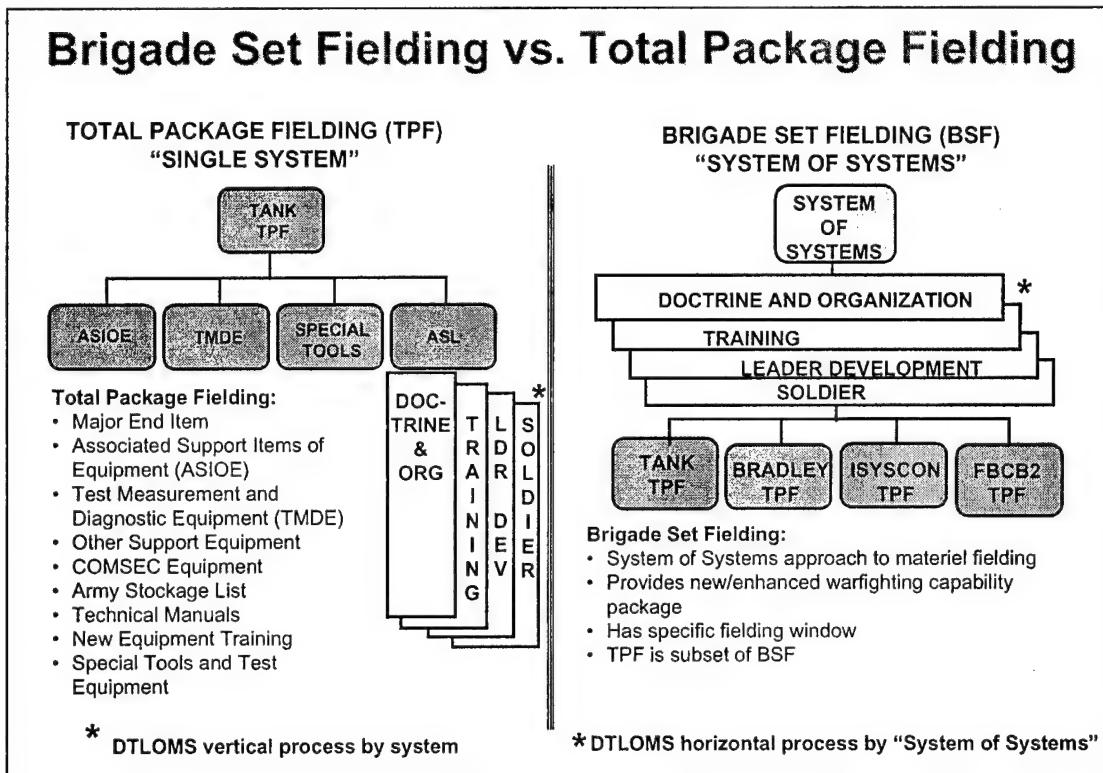


Figure C-2
Brigade Set Fielding vs. Total Package Fielding

will provide the structure to discipline, manage and operationalize this extremely complicated process to identify and resolve issues across all DOTLMS (Figure C-2).

To successfully execute BSF, certain terms have been defined to ensure a common reference point for actions.

1. **System of Systems** refers to a modernization approach by organization rather than by individual pieces of equipment. Through a DTLOMS analysis and application of a packaged System of Systems, a Brigade/Brigade Combat Team achieves a new and/or enhanced warfighting capability. The equipment becomes the enablers that allow the system (UNIT) to accomplish its tasks.

By integrating the development, procurement and fielding of new equipment to the Brigade/BCT, we integrate a System of Systems where each weapons platform, C4I component and support vehicle is an interdependent piece of the network that supports and enhances the operations of all the other components.

2. **System of Systems Manager (SOSM)** is the primary "synchronization" manager to integrate equipment fielding across all the DTLOMS domains. He provides direction and oversight to the many individual PMs responsible for the Total Package Fielding (TPF) of single systems to the unit in the BSF window.

The Army DCSOPS has been designated as the SOSM for BSF.

3. **Digitization** is a subset of modernization. It has been an underlying guiding principle of modernizing the force and is a means of realizing a fully integrated command and control capability across the spectrum, from the strategic to the tactical, including interoperability links with joint and multinational forces. Treated as a total system of systems package, Digitization across the Army modernization program offers synergistic increases in lethality and survivability as the Army transitions to a smaller, force projection force. The timely sharing of information enabled by Digitization significantly improves the ability of commanders and leaders to make decisions quickly, synchronize forces and fires, and increase the operational tempo.

The Army established Brigade Set Fielding as the institutional process to digitize and modernize all Army units (Heavy, Transformation and Light). The fielding of the 1st Cavalry Division in 2003 will provide the baseline execution methodology for all follow-on organizations and the experience to develop an Army Master Fielding Schedule (AMFS).

Each Brigade/Brigade Combat Team and its parent headquarters, if applicable, will have a designated fielding window identified in the AMFS and will execute BSF following a process that includes planning/preparation, equipping/training, and certification.

BRIGADE SET FIELDING PHASES

BSF will consist of five phases, shown in Figure C-3. In preparation for Phase 1, several things must take place. First, installation support requirements must be in place. This means the simulators/simulations, training facilities (e.g., training rooms, digital ranges, etc.), and Fixed Tactical Internet (FTI) are available. FTI is critical to the sustainment training of the Brigade/Brigade Combat Team as it allows the unit to train without having to deploy the signal battalion assets to the field. Second, the division signal battalion or brigade slice will be fielded with its digital systems, if available. The primary trainers and maintainers of the signal equipment must have time to become proficient on digital fielding and training so they can support the headquarters staff training and the BCTs as they field. Although the signal battalion may be required to maintain both analog and digital equipment, this will immediately provide the division the capability to have information dominance.

Phase 1 fields the division headquarters, brigade headquarters, separate battalion headquarters, general support and aviation units. This is critical for two reasons. First, subsequent fielding cannot be accomplished until the digital backbone (ACUS MOD, MCS, ASAS, AFATDS) is in place. Second, but perhaps most important, once digitized, the division structure can provide C2 to non-digitized units with increased effectiveness. This is the fastest possible path for restoring warfighting readiness.

- ♦ Phases 2 through 4 are the fielding of the three BCTs. Each BCT will require six months to complete and will

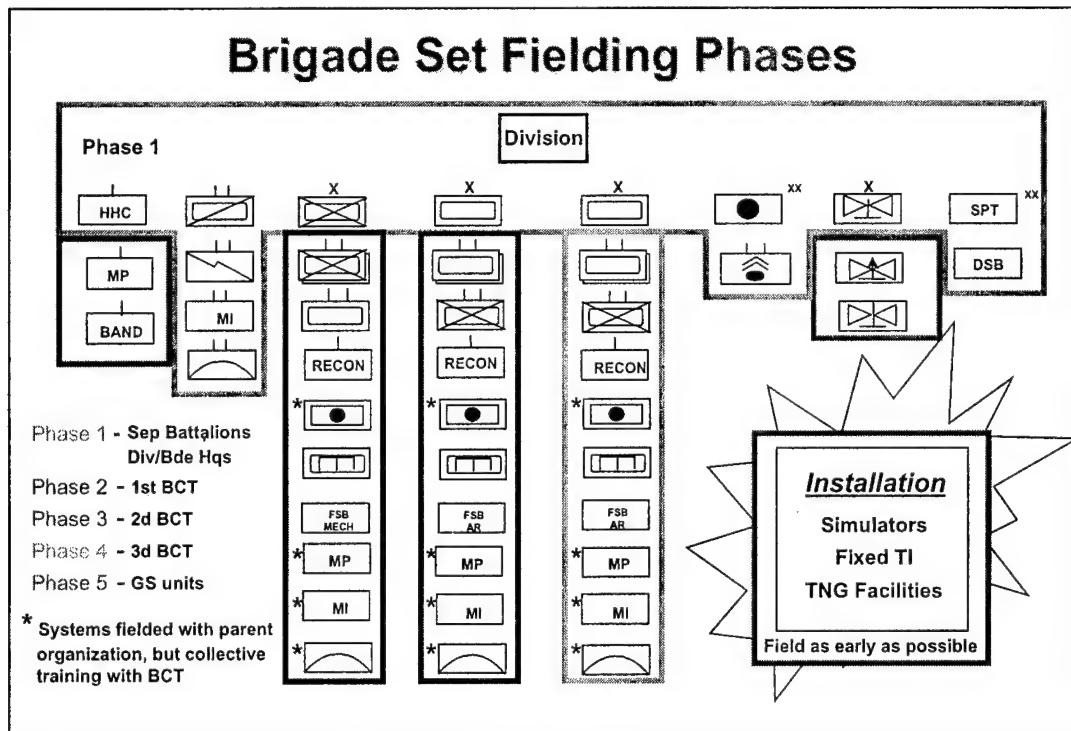


Figure C-3
Brigade Set Fielding Phases

include the turn-in of equipment, draw of new equipment, New Equipment Training (NET), and collective training and certification.

- ◆ Phase 5 fields the Military Police (MP) Company and the band.

All available Category 1 and 2 systems will be fielded to the Brigade/Brigade Combat Team during this fielding window. Category 1 systems represent the minimum backbone C3 systems necessary to provide synergism.

Completion of their fielding will be the discriminator between "digitized" and analog. Category 2 systems allow the division to capitalize on the information advantage afforded by the Category 1 systems. Additionally, other systems that are available and do not adversely effect Category 1 and 2 Systems fielding will be included in this window. The goal is to field as many systems as possible during the BSF window, to reduce turbulence on the unit, and to minimize the time normally required to modernize a unit.

Annex D

Costs Associated with Equipping the First Digitized Division and First Digitized Corps

The III Corps at Fort Hood, Texas has been selected as the Army's First Digitized Corps (FDC). The 4th Infantry Division (-) will be the First Digitized Division (FDD), equipped with all U.S. Army Training and Doctrine Command (TRADOC) Category 1 systems (the core command, control and communications systems) and available Category 2 systems (sensors and weapons platforms) by the end of 2000. III Corps will be similarly equipped by the end of 2004. Because the Army will field by Brigade Combat Team sets by installation, the 3rd Brigade of the 4th ID and the 3rd ACR at Fort Carson, Colorado will be equipped with digital systems by the end of 2004.

The procurement (PAA-Procurement Appropriations Army) cost of the remaining digital equipment being fielded to the FDD is estimated to be \$332.1 million over fiscal years 2000-2005. This total is a subset of the incremental cost of digitization described in the main body of the report. Changes from the fiscal year 1999 submission can be attributed to the addition or deletion of systems, as well as adjustments to program funding lines as program schedules have been adjusted. For instance, Wolverine, Grizzly and Command and Control Vehicle (C2V) programs have been recommended for cancellation.

The remaining procurement costs for equipping the remainder of III Corps with its digital systems is estimated at \$1723.2 million over fiscal years 2000-2005. This includes equipping the 3rd Brigade of the 4th ID, the 1st Cavalry Division, 3rd Armored Cavalry Regiment, III Corps

Headquarters, and appropriate III Corps support elements.

The systems listed in the following tables reflect only those for the FDD and FDC. The procurement dollars associated with each program are based on the Fiscal Year 2001 President's Budget. The tables do not include RDTE, Operations and Maintenance (O&M), or costs of programs purchased or fielded prior to fiscal year 1999. It is not practical to associate portions of various program RDTE costs with a particular unit or division, as the research and development that results in a piece of equipment benefits all units that receive that equipment over time. Programs like the M1A1 tank and M2A2 Bradley include only the cost of integrating digital technologies onto the platforms.

Detailed breakouts for the procurement costs, by system and year, are shown in Tables D-1 and D-2. Table D-1 shows the procurement costs for equipping the FDD. Table D-2 shows the procurement costs for the remainder of III Corps, not *including the FDD. Note: The FDC is a two division Corps.

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FDD	FY00	FY01	FY02	FY03	FY04	FY05	TOTAL
System	PAA (\$M)	PAA (\$M)	PAA (\$M)	PAA (\$M)	PAA (\$M)	PAA (\$M)	PAA (\$M)
A2C2S			26.2				26.2
AFATDS							0.0
AMPS					0.7		0.7
Applique	56.2						56.2
ASAS	2.7	2.3					5.0
Avenger Slew to Cue							0.0
BCIS	13.4	18.8	18.8	18.8	18.8	6.9	95.5
BFIST			22.8			5.5	28.3
C2V			TERMINATED				0.0
CGS	17.6						17.6
DTES				5.5			5.5
DTSS		0.8	3.3				4.1
FED	0.3						0.3
Firefinder Radar							0.0
GBS							0.0
IDM/EBC	9.3						9.3
IMETS	1.2	0.5					1.7
Info Assurance *	1.3						1.3
ISYSCON	0.4						0.4
Land Warrior				1.1			1.1
M1A1/2 Abrams							1.9
M2 ODS **	5.5						5.5
M2A3 **	1.3						1.3
MCS	11.9		9.5	1.7			23.1
MFCS	3.7	12.5					16.2
Paladin	4.8						4.8
PLS-E	3.8						3.8
SCAMP							0.0
SICPS							0.0
SMART-T							0.0
SPITFIRE							0.0
STRIKER			8.2			1.5	9.7
TOCs	14.1						14.1
ACUS-MOD	0.4						0.4
Wolverine		TERMINATED					0.0
TOTAL BY YEAR	147.9	34.9	88.8	27.1	19.5	13.9	332.1

Changes from FY99

* C2P--Information Assurance

** M2--M2ODS/M2A3

Table D-1
Procurement Costs for First Digitized Division (4th ID(-))

Costs Associated with FDD and FDC

FDC	FY00	FY01	FY02	FY03	FY04	FY05	TOTAL
System	PAA (\$M)						
A2C2S				53.9	49.9		103.8
AFATDS	6.0	2.4	6.8	3.3			18.5
AMPS		2.8	2.8		0.6		6.2
Applique		60.8	111.4	170.7	151.5	225.8	720.2
ASAS	7.9	5.6	3.2				16.7
Avenger STC		6.8	9.5	8.7			25.0
BFIST		36.5	28.3	3.0		5.5	73.3
C2V	TERMINATED						0.0
CGS	22.0	8.0	22.0				52.0
DTSS	6.0	4.5					10.5
FAADC2	2.5						2.5
FED	1.3	4.1	5.6				11.0
Firefinder Radar							0.0
FISTV	23.0	40.0					63.0
GBS	4.0						4.0
Grizzly	TERMINATED						0.0
IDM/EBC	9.3						9.3
IMETS		0.8	1.3	1.3	1.4	1.5	6.3
Info Assurance	1.3	2.5					3.8
ISYSCON	4.6	0.9					5.5
Land Warrior				5.1	3.4	6.1	14.6
M1A1/2	4.5	11.0	13.7	15.2	12.0	18.0	74.4
M2 ODS		16.0	2.8	1.7	0.6		21.1
M2 A3	1.3	1.8	2.5	1.8	1.2		8.6
MCS	9.1	22.9	1.5	24.1	14.9		72.5
MFCS			17.2				17.2
Paladin	5.4	0.1					5.5
PLS-E	2.4	6.3	7.3				16.0
SCAMP	0.1	0.1					0.2
SICPS	30.1	36.1	17.8	20.1			104.1
SINCGARS							0.0
SMART-T	1.2						1.2
SPITFIRE	0.8						0.8
STAR-T				7.6			7.6
Striker		13.2	8.2	0.5		1.5	23.4
TES-Basic *					5.0		5.0
TES-Fwd *				21.5			21.5
TOCs	14.0	17.3	29.6	32.5			93.4
ACUS-MOD	14.5	82.0	5.0	2.5	0.5		104.5
Wolverine			TERMINATED				0.0
TOTAL BY YEAR	171.3	382.5	296.5	373.5	241.0	258.4	1723.2

Change from FY99

* DTES--TES Basic/TES Fwd

Table D-2
Procurement Costs for First Digitized Corps (III Corps)*

A2C2S	Airborne Command and Control System
ACUS MOD (ATM/HCLOS)	Area Common User System (Asynchronous Transfer Mode/High Capacity Line of Sight)
AFATDS	Advanced Field Artillery Tactical Data System
AMPS	Aviation Mission Planning System
ASAS	All Source Analysis System
BCIS	Battlefield Combat Identification System
BFIST	Bradley Fire Integration Support Team
CGS	Common Ground Station
CSSCS	Combat Service Support Control System
DTSS	Digital Topographic Support System
FAADC2	Forward Area Air Defense Command and Control System
FED	Forward Entry Device
FISTV	Fire Support Tactical Vehicle
GBCS/AQF	Ground Based Common Sensor/Advanced QuickFix
GBS	Global Broadcast Service
IDM/EBC	Improved Data Modem/Embedded Battle Command
IMETS	Integrated Meteorological System
ISYSCON	Integrated System Control
JSTARS CGS	Joint Strategic Air Reconnaissance System Common Ground Station
JSTARS GSM	Joint Strategic Air Reconnaissance System Ground Station Module
M1A1/2	Abrams Main Battle Tank
M2	Bradley Fighting Vehicle
M2 ODS	M2 Operation Desert Strom (Variant)
MCS	Maneuver Control System
MFCS	Mortar Fire Control System
MLRS	Multiple Launch Rocket System
PLS-E	Pallitized Loading System - Enhanced
SCAMP	Single Anti-Jam Manportable Terminal
SICPS	Standard Integrated Command Post System
SINCgars	Single Channel Ground and Airborne Radio System
SMART-T	Secure Mobile Anti-Jam Reliable Tactical Terminal
STAR-T	Super High Frequency Tri-Band Advanced Range Extension Terminal
STC	Slew to Cue
TES Basic	Tactical Exploitation System Basic
TES Fwd	Tactical Exploitation System Foward
TOC	Tactical Operations Center

Table D-3
Acronym List for Table D-1 and D-2

Annex E

Information Systems Assurance

This is not a problem we will solve. It is one we can get a handle on.

- *Deputy Secretary of Defense John White*

As the U.S. Army is evolving into a force for the 21st century (Force XXI), the Army's digitization efforts move forward at an accelerated rate. More and more of the Army's information systems (ISs), which until now have been unable to communicate and share information, are being widely connected and must remain connected to pass the digital information necessary to support the commanders' decision cycles. The transition to digital systems makes it possible to fuse information on the battlefield and improve the lethality of our soldiers; however, their survivability and sustainability depends on the proper implementation of security for these systems. This annex describes the efforts of the Army's Information Systems Vulnerability And Protection (ISVAP) program to ensure all Force XXI battlefield systems are adequately protected when they are fielded and as they seamlessly connect from the deployed forces back to their sustaining base power projection platforms.

INTRODUCTION

The Army's digitization efforts today will result in a wide variety of automated systems to send and receive orders, distribute situation awareness, present a common relevant picture, and manage logistics. These maneuver, intelligence, fire support, mobility/survivability, air defense, logistics, and command and control systems are ranked and prioritized based, at least in part, on when the system is expected to be fielded; however, as the U. S. Army moves to

exploit commercially available information technologies, it also must address the same vulnerabilities that the commercial world focuses on – threats from computer hackers and viruses. The Army knows that there are vulnerabilities associated with digital systems and is serious about protecting its C² systems against these vulnerabilities. The Army also recognizes, however, that complete protection against known and future vulnerabilities is not feasible. For a complete discussion, see Defense Science Board, *Report of the Defense Science Board Task Force on Information Warfare-Defense (IW-D)*, November 1996, Office of the Secretary of Defense.

As a vehicle to take on the challenge of managing these security issues, the Army Digitization Office (ADO) formed the ISVAP Program in late 1997 to coordinate the development, assessment and integration of information systems protection. The working teams of the ISVAP include the Integrated Concept Team (ICT) and the Integrated Product Team (IPT). These teams provide recommendations to the Army leadership. Shortly after its creation by the ADO, the IPT mission moved to the Information Assurance Directorate of the Office of the Director of Information Systems for Command, Control, Communications and Computers (ODISC4).

The ICT is led by TRADOC and includes Army schools and centers, TRADOC System Managers, and the TRADOC Program Integration Office (TPIO) ABCS.

The ICT works in parallel with the IPT, which focuses on protection mechanisms for digitized units, that will be fielded from 2000 to 2004, in the following phases:

- ◆ Phase I—First Digitized Division (FDD)
- ◆ Phase II—Objective Digitized Division (ODD)
- ◆ Phase III—First Digitized Corps (FDC)

A full understanding of the development protection systems is not possible without first understanding the IPT organization, mission and authority, and oversight process.

IPT ORGANIZATION

The IPT is organized into four working groups (see Figure E-1) with participation from the Program Managers (PMs), Program Executive Officers (PEOs), organizations under the Army Materiel Command, Army Laboratories, HQDA agencies, and other related activities with representation on the team. Each of the four working groups is chaired by a key organization, whose support is critical to

the success of the Force XXI process. The IPT is charged with overseeing and guiding the security aspects of acquisition programs, system security technologies, and vulnerability assessments for systems in development.

The scope of responsibility for the various working group Chairs is Army-wide. They have the authority to enforce action items given to other organizations.

DISC4 serves as Chair and is the single authority lead for the C2 Protect TRIAD (i.e., Deputy Chief of Staff for Operations (DCSOPS), Deputy Chief of Staff for Intelligence (DCSINT), and Director of Information Systems for Command, Control, Communications and Computers (DISC4)) in IPT matters.

The objective of the ISVAP IPT oversight process is for each system and system of systems in the digital force to implement an appropriate protection concept and to have that protection concept validated by testing. The ISVAP IPT provides the oversight necessary to ensure that all systems provide their portion of the defense-in-depth strategy, that the totality

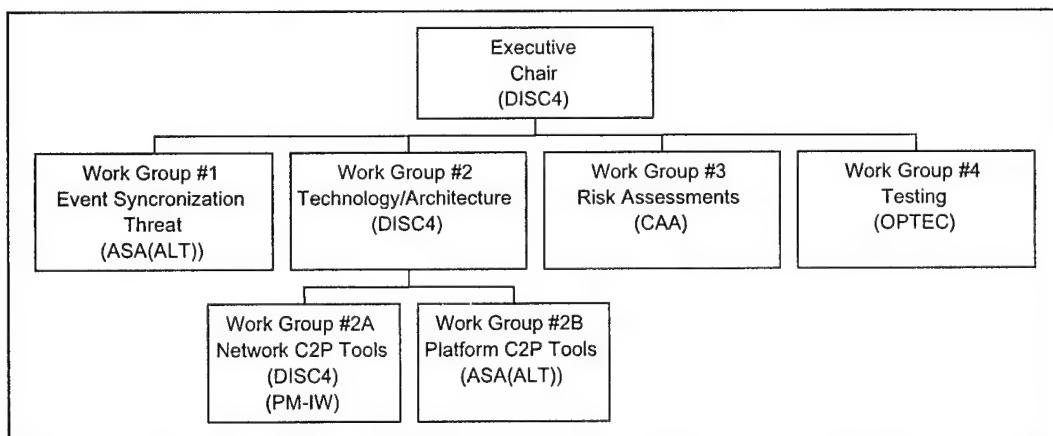


Figure E-1
Organizational Structure for the ISVAP IPT

of the system of systems protection is in place with no weak links or gaps in the protection perimeters, and that the tradeoffs between performance and security are made appropriately. This means that the ISVAP IPT must maintain cognizance of all the systems participating in a particular digitization/modernization effort and must understand their relative importance to both operations and security.

IPT WORK GROUPS

Work Group #1: Synchronization

This work group, headed by the Office of the Secretary of the Army Acquisition, Logistics, and Technology (SAALT), starts with the schedule of testing and other significant events leading up to the fielding of the FDD. It then compares the schedules for installing the necessary tools and protection devices into the components of the FDD and ensures the fielding makes sense for the long-term health of the FDD. It synchronizes the fielding dates and test and exercise events to make sure the maximum utility is gained by these events.

Work Group #2: Architecture/Technology

This work group, headed by DISC4, is responsible for the placement of the security items into the FDD systems design. This group also works with the Program Executive Officer Command, Control, and Communications (PEO C3S) Information Assurance IPT on the individual engineering details of the security architecture for FDD. There are two sub-working groups under the Architecture/Technology Working Group,

one for network level protection and the second for the platform level.

Work Group #3: Risk Assessments

This work group, headed by the Army's Concepts Analysis Agency (CAA), determines which modeling and simulations are needed to enhance the development of the FDD and schedules the Modeling and Simulation (M&S) events, in conjunction with the testing (work group #4) and synchronization (work group #1). It takes test data from vulnerability assessment events and uses it in the FDD "model" to determine the degree to which proposed fixes are successful and what further work needs to be done to protect the FDD networks.

Work Group #4: Vulnerability Assessment/Planning

This work group, headed by the Army's Test and Evaluation Command (ATEC), develops evaluation criteria and test procedures, and documents results of Vulnerability Assessment (VA) events conducted by the Land Information Warfare Activity (LIWA), Survivability Lethality Analysis Directorate (SLAD), Program Manager Information Warfare (PM IW), the Army's Communications-Electronics Command (CECOM), the NSA, and other agencies. Test results are forwarded to the acquisition community, including the materiel developer and combat developer, as well as to work group #3 for use in M&S analysis.

SECURITY APPROACH

There is widespread agreement that the Army cannot eliminate risk within the system of systems comprising the

digitized force. The challenge, therefore, is determining an "acceptable" level of risk. The very nature of the rapidly changing information technology (IT) environment means keeping abreast of all the vulnerabilities and the associated risks those vulnerabilities pose on a dynamic force. The best we can expect to do is understand that we will never be able to eliminate risk completely; therefore, we must learn to manage risk.

RISK MANAGEMENT: TWO PROCESSES

The effective management of risk involves two interlocking processes. The first process, Defense-in-Depth, takes advantage of the IPT's influence over the Army's security architecture for the FDD. It focuses on integration of information

systems protection features into digitization systems, networks, infrastructure, and unit operations. The second process, Vulnerability Assessments, focuses on execution of protection in the operational unit. It uses vulnerability assessments to find and fix the areas of potential compromise in Army systems. Critical to this protection concept is a transition from risk avoidance to risk mitigation and management. The protection is an integrated "defense-in-depth" approach to information system, network, and network infrastructure protection based on insights gained from the Task Force XXI (TFXXI) Advanced Warfighting Experiment (AWE), the Division XXI AWE (DAWE), as well as studies and guidance on information warfare and related topics.

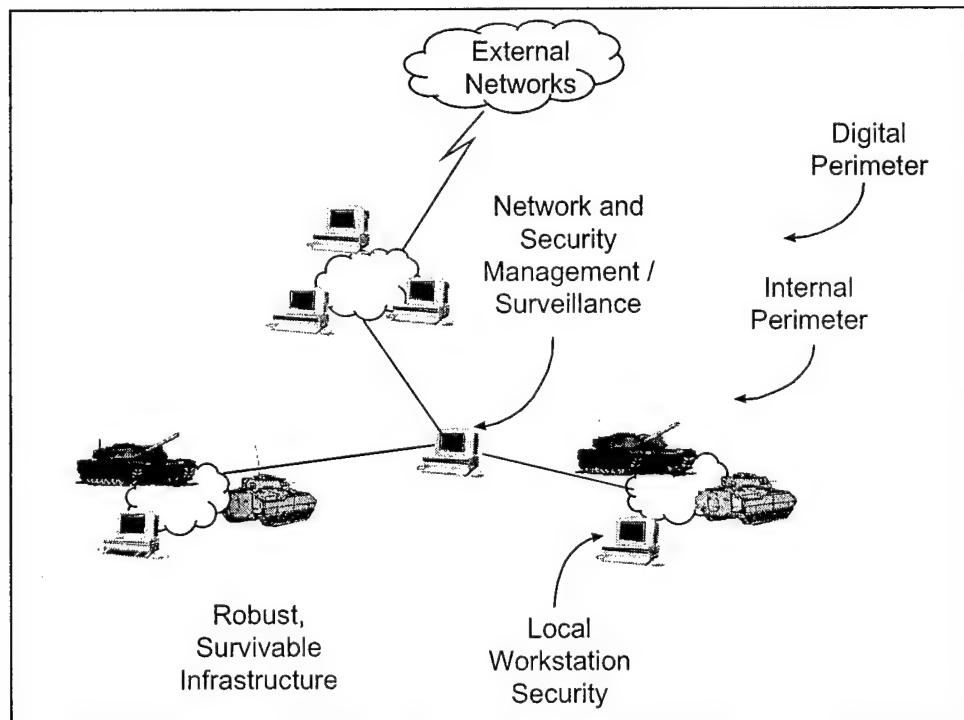


Figure E-2
Defense-In-Depth Top-Level Concept

Process 1 – Defense-In-Depth

Army XXI information systems protection incorporates the Defense-in-Depth strategy. Defense-in-Depth comprises several separate layers of defense based on network geography (such as perimeters, computer enclaves, etc.) and/or protection functionality (such as access control, intrusion detection, security management, etc.). Each layer provides independent protection such that an adversary must defeat multiple barriers before accessing sensitive systems or information (Figure E-2).

There is an outer perimeter as well as multiple inner perimeters. Each perimeter protects, detects, and responds to threats against the transport network first, and information systems second, to assure the network's availability to commanders. The concept includes such details as:

- ◆ External digital perimeters composed of COMSEC, firewalls, security guards, and, where necessary, physical isolation serving as a barrier to outside networks such as the Non-Classified Internet Protocol Router Network (NIPRNET);
- ◆ Internal digital perimeters, consisting of firewalls and/or router filtering, serving as barriers between echelons and/or functional communities (Internal barriers may also be augmented using COMSEC and guards.);
- ◆ A secure local workstation/platform environment, consisting of individual access controls, configuration audit capability, C2 Protect tools, and procedures;
- ◆ Intrusion detection systems (IDSs) at network perimeters and at the host computer itself;

- ◆ Security management capabilities appropriately tied to network management systems providing real-time network surveillance and reaction to network intrusions; robust, resilient infrastructure designed to contain damage and be readily repairable in the event of attack. The fundamental criteria are (1) no single attack leads to failure of a critical function, and (2) no critical function or system is protected only by a single protection mechanism.

Process 2 – Vulnerability Assessments

The second of the two interlocking processes focuses on vulnerability assessment to determine the success of the protection mechanisms. Vulnerability assessments of individual systems should be conducted as part of the certification and accreditation process during development and Test and Evaluation (T&E) events for both C3I systems and weapon systems that are going to operate in a networked mode. For an information system infrastructure or a system-of-systems, vulnerability assessments should be conducted during experiments, training events, and RDT&E events to (1) determine the level of protection achieved, (2) identify existing residual and new vulnerabilities, and (3) provide feedback to impact system, architecture, design, and development efforts. The IPT establishes vulnerability assessment priorities. The IPT also identifies and reviews issues and makes recommendations necessary to ensure C2 Protect mechanisms are integrated into the digitized force in the joint and combined, integrated, tactical, operational, and sustaining base environments. The IPT oversees the full cycle of the procurement process to implement these necessary mechanisms.

Annex F

Anticipated Impact on the Training Base

Currently, Army Training XXI consists of three axes or points of main effort: Warfighter Modernization XXI (WarMod XXI), Warrior XXI, and Warfighter XXI. WarMod XXI focuses on Army Modernization Training and Training Subsystem Acquisition. Warrior XXI focuses on the institutional pillar of training—the classrooms, real or virtual, in which individual soldiers are trained. It is the vision of how the TDA/Institutional Army must adapt to support Army XXI. Warfighter XXI is the unit training pillar, which includes collective training, leader development and battle staff and individual training conducted in units.

In a collaborative effort, TRADOC and U.S. Army Forces Command (FORSCOM) Training Investment Strategy Process Action Team (TISPAT) will develop the training strategy that will meet the needs of the Active, Reserve, and National Guard components during fielding of digital equipment. Classroom infrastructure upgrades, Combat Training Center (CTC) and homestation upgrades, development of distance learning products, and range modernization to support digital fielding all need to be resourced.

WARMOD XXI (ARMY MODERNIZATION TRAINING)

Historically, each system proponent develops a plan to field, train, and sustain a new piece of equipment; however, many of the new systems must operate together to accomplish the desired results or to create a synergistic effect. In these instances, it may be more reasonable to field a system of systems training support package, fully embedded within the

tactical system hardware/software. This embedded training system will support individual system training as well as integration and follow-on unit collective training. The system would require automated linkages to each individual item of equipment as well as a tactical engagement system (TES) to provide a stimulus for mission equipment. It must also possess a suitable after action report (AAR) capability necessary to identify shortcomings that can be used to continuously improve tactics, techniques, and procedures to take full advantage of the capability of the designated system of systems. This system of systems training support package can then be used to sustain a unit training capability and also be exported through a Wide Area Network to each successive unit scheduled to receive new digital equipment.

Digital hardware and software changes require a more flexible system to develop and deliver doctrine and resulting instructional courseware (Figure F-1). The Army can no longer afford to develop separate training packages for new equipment, institutional, and unit sustainment training. We must require the system Program Executive Office (PEO) and program manager (PM) to plan, program and budget for the development of embedded training and interactive multimedia instructional packages to cover system operations, maintenance, and employment tasks. This will be done in close coordination with the TRADOC Proponent. Additionally, the PM needs to provide technical manual data in digitized form to Joint Computer Aided Acquisition and Logistic Support (JCALS). This digitized data can be loaded into the TRADOC

approved automated system for training development—the Automated Systems Approach to Training System (ASAT). Proponents can access task information in ASAT to further develop Warrior XXI and Warfighter XXI training support packages for system employment—“How to Fight.” If task analysis is a requirement within the contract, the contract should specify using ASAT software as the tool. Modifications to Training Aids, Devices, Simulators, and Simulations (TADSS) to support digital training along with any new TADSS requirements must be identified and funded in concert with hardware and software development to support total package fielding.

WARRIOR XXI (INSTITUTIONAL TRAINING)

Through its subordinate schools, TRADOC is responsible for developing training and producing the trained soldiers and leaders needed by all U.S. Army forces. It must provide a steady supply of trained soldiers to field units to replace losses caused by normal attrition and rotation. To accomplish this, TRADOC must integrate training through the appropriate training courses and programs to ensure trained soldiers and leaders are available when needed and with the necessary skills.

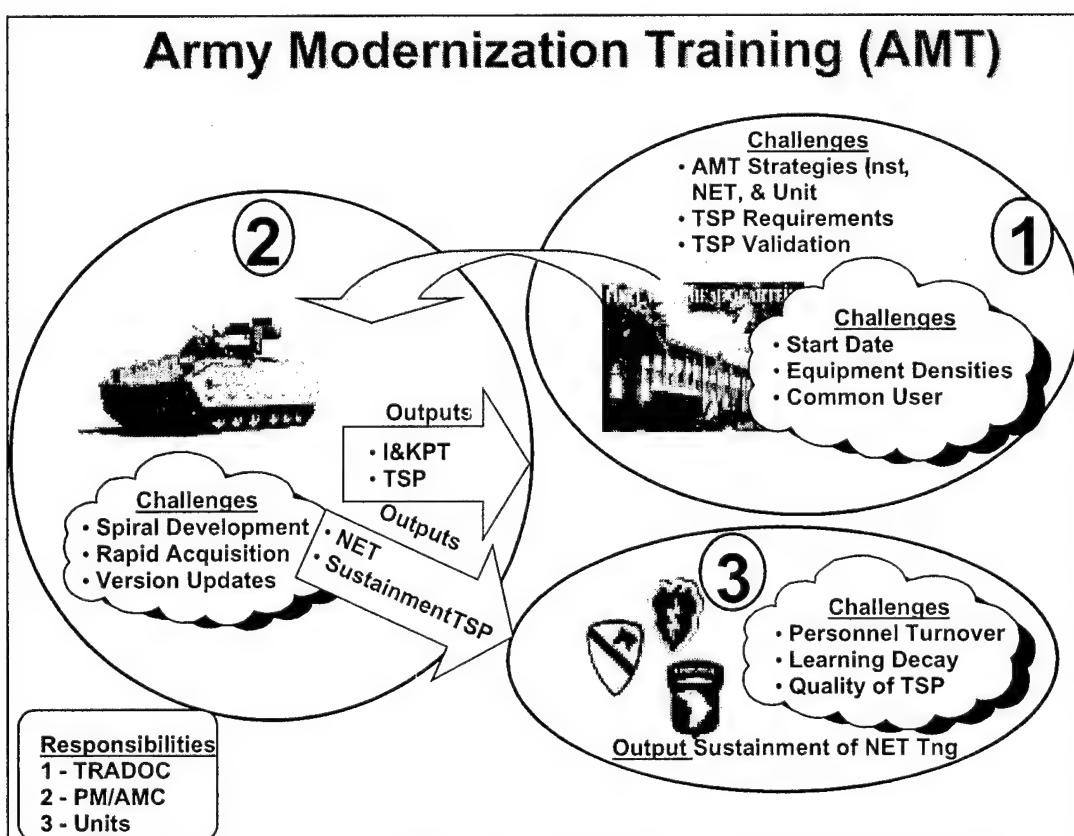


Figure F-1
Army Modernization Training

Equipment density and fielding schedules will necessitate the sustainment of redundant training systems in the Army. Digital training is additive in nature, as fundamental understanding and the requirement to train in a degraded mode means that analog training will still be conducted. The determination of skills, knowledge, and attributes (SKA) required to field trained, combat-ready soldiers and leaders is a high priority. This will have a consequential impact on course length, structure, and instructor manpower requirements.

The Army must develop multifunctional soldiers and adaptive leaders who can utilize both analog and digital processes to operate in a tactical operational and joint environment. Training is being reviewed for all enlisted soldiers, non-commissioned officers (NCO), officers, and warrant officers (WO). The training program must encompass initial training and sustainment of digital operational, employment, and leadership tasks for affected Military Occupational Specialties (MOSs) and branch codes.

The Institutional Digital Education Plan (IDEP) is TRADOC's plan to integrate the necessary training throughout TRADOC institutional courses and programs. The plan describes the anticipated end-state for the training system, and a transition plan to reach the objective system. The IDEP:

- ◆ Provides the TRADOC plan to integrate ABCS training throughout all TRADOC centers and schools to support and sustain the U.S. Army's digitization strategy with appropriately trained soldiers and leaders;
- ◆ Provides a plan to transition from the current interim localized training

system into the long-term solution: the TRADOC institutional training system;

- ◆ Provides interim guidance to TRADOC centers and schools pending development or amplification of a TRADOC regulation or policy letter for development, integration, and execution of training to support the U.S. Army's digitizing force;
- ◆ Identifies a digital training model and defines the categories of ABCS training appropriate for integration into TRADOC institutions through resident and distance learning applications;
- ◆ Provides resource cost estimates for the facility modernization, equipment, personnel, and training development requirements needed to prepare TRADOC to institutionalize ABCS training; and,
- ◆ Links institutional digital training in the near-term with Digital Division 2-n (DD2-n) fielding and assignment plan.

The Army will be prepared to integrate digital training into existing institutional training no later than fiscal year 2002. The TRADOC Deputy Chief of Staff for Training (DCST) established a cell (Warrior-T) within the PEOC3S's Central Technical Support Facility (CTSF), Fort Hood, as a key component of the transition strategy. Warrior-T is there to assist PMs and TRADOC system proponents in development of tactics, techniques, and procedures (TTPs) and Army Battle Command Systems (ABCS) training development through 2002.

Proponents will load training material for access through the Army Doctrine and Training Digital Library (ADTDL) for distribution supporting resident and nonresident training at institutions, units, and individual soldiers in a distance

learning mode. The just-in-time training and other training material will make use of a true multiple media approach including the Internet, videotraining, and CD-ROM. As a result, there will be standardized training throughout the Total Force, which can be updated and disseminated rapidly.

Courses that are candidates for distance learning will be prioritized in terms of how critical they are to maintaining readiness and how long it will take to realize a return on investment. Research led TRADOC to conclude that distance learning is appropriate for all content areas the Army trains, with the following exceptions:

- ◆ Intense hands-on courses such as: One Station Unit Training (OSUT); Basic Combat Training (BCT); Advanced Individual Training (AIT); Officer Basic Course (OBC); Command and General Staff College (CGSC); Special Skills Training (Ranger, Airborne, Special Forces), Primary Leadership development Course (PLDC), and the Sergeants Major Course;
- ◆ Courses or portions of courses that include capstone exercises involving collective performance of combat arms tasks under high stress conditions; and,
- ◆ Portions of courses that involve training soldiers in Army values and in moral and ethical decision-making when it is determined that face-to-face role modeling is the best way to foster development of these characteristics.

Army modernization and experimentation have provided several promising avenues for continued emphasis in leader development doctrine. Digitization and improved analog command and control

systems provide decision-making enablers that improve situational understanding. Characteristics of Future Leader Development System:

- ◆ Embeds branch "ethos" in early technical training
- ◆ Transitions focus from Branch to BOS to strategic leadership
- ◆ Integrates leader and team development processes
- ◆ Promotes command and leadership teaming
- ◆ Institutionalizes digital analysis and staff competency
- ◆ Includes Combat Training Center (CTC) situational learning in selected leader courses
- ◆ Supports life-long learning strategy for military and civilians
- ◆ Exploits web-based training capabilities, digital libraries, simulations/simulators
- ◆ Leverages the Total Army School System (TASS)

Warfighter XXI (Unit Digital Training Strategy)

Concurrently, a strategy must be developed to capitalize on the lessons learned during the Army Experimental Campaign process and expand the digital training strategy to the remainder of the force. A key component of this strategy must be ensuring that non-digital units also remain combat ready prior to and during digitization. This strategy will cover all training that occurs in the receiving unit: individual sustainment; refresher; leader development; battle staff training from battalion through corps; and

collective training from crew through corps.

Much of this training has already begun, especially for the heavy force, as demonstrated in recent AWEs. The strategy under development will be applicable to the remainder of the force as those units both modernize and digitize. The initial effort will be conducted at Fort Hood, Texas, but is rapidly expanding to encompass the light axis of the Army Experimental Campaign Plan (AECP) and the Transformation Force. As other units digitize in accordance with the Brigade Set Fielding (BSF) concept, training will take place at their respective installations. Lessons learned from the AECP and the associated installation-specific Training Strategy components must be resourced and available prior to implementation of BSF.

Digital fielding also impacts how we train at CTCs and expands the role of CTCs in training for asymmetrical threats, such as urban combat, proliferation of weapons of mass destruction, and greater intermingling of combatants and noncombatants on the battlefield is being

assessed. This training will not dilute or detract from our warfighting focus, but will place additional emphasis on emerging threats. Our efforts at CTCs will be paired with an increased, more cost-effective, and balanced use of live training, distance learning, and virtual and constructive simulations at home station. We have made tremendous gains in learning how to mix new training technologies with traditional field training. As result of this effort, we will be properly positioned to provide a support base for realistic, relevant training that supports the Army's training vision of 2010. The Army's training vision 2010 provides seamless, real-time, integrated training across the live, virtual, and constructive training domains at home station, the CTCs, and while deployed.

Increases in OPTEMPO, continuing budget constraints, force modernization, and the impacts of digitization have severely affected the Army's ability to provide a trained and ready force. If resourced to implement the proposed Training Strategy, the Army will be poised to meet the challenges of the 21st century.

Annex G

Anticipated Impact on the Personnel System

IMPACT ON THE FUTURE FORCE

Increased lethality and more complex missions will tend to result in smaller units operating with more autonomy than at present, placing a premium on "superior leadership." Many believe that the dominant factor driving organizational changes and manning requirements, at least until 2020, will be an Army that will have a higher leader-to-led ratio than at present. As weapons platforms become more automated, guns that used to be crewed by five may some day be crewed by two or even one. The growth of information technology, where computing performance is currently doubling every eighteen months, is expected to accelerate in the foreseeable future as semiconductor processor capability is theoretically able to achieve growth of at least another thousand-fold before a completely new technology obviates this one.



At this point, weapons platforms which are not merely remotely piloted, but actually commanded by artificial intelligence linkages with human oversight, will allow for the reduction of followers at an even greater magnitude. Thus, the Army will become increasingly populated with

platform, system, and information integrators as a percentage of its force. This is important because congressional guidance requires that by the year 2010, fifteen percent of Army systems be unmanned. That requires soldiers who are highly technical to operate and maintain remotely piloted systems that increase soldier survivability on the battlefield.

There will be a "window of vulnerability" in the early years as the Army transitions to a digitized force. Initially, digitized training will not be embedded in the curricula soldiers receive through Army schoolhouses, but it will be taught locally. Thus, only a portion of the force will have the capability to function in a digitized environment. If a digitized force committed to a contingency operation sustains significant casualties, it will be difficult to generate digitally qualified replacements on short notice. Eventually, as the majority of the force is digitized, appropriate training will be resident in the schoolhouse curricula, and all soldiers will be available for assignment to a digitized unit. The window of vulnerability will last between four and eight years, depending on how rapidly this training is embedded in schoolhouse instruction programs.

WHAT THIS MEANS IN TERMS OF THE ARMY TRANSFORMATION

A short review of the Transformation Campaign Plan is useful. The plan calls for transforming the two Fort Lewis, Washington, brigades to Initial Brigade Combat Team (IBCT) status starting in Spring 2000. They will use leased and surrogate platforms to refine the Interim Force doctrine. The Army will move

quickly, in Summer 2000, to let contracts for Interim Armored Vehicles (IAV). To reduce logistics requirements, the same chassis will be used in several variants, including anti-tank missile launcher, mortar carrier, scout, and medical. As the IAVs are fielded, additional brigades (but not the two Initial brigades) will be converted to IBCTs. During this Interim period, the Army will still retain its heavy capability in both the III Corps, designated as the Strategic Counterattack Force, and in the Guard.

Eventually, as the technology becomes available, the Army will transform all its brigades to the Objective Force design. Here it will harvest efficiencies derived from a universal unit design. Since all brigades will be alike, each can share in the worldwide missioning burden, spreading OPTEMPO throughout the entire Operational Army. With common platforms and by eliminating specialized divisions, there will be the opportunity to shrink the Army's 240 military occupational specialties and 79 Career Management Fields, making it easier and more equitable to assign soldiers throughout the Army. The seven characteristics of the Objective Force will all be significantly enhanced over those of today's Army of Excellence, obviating the need for heavy forces.

There is also an expectation that technology will be advanced enough by the Objective Force that a certain percentage of combat vehicles will be unmanned. These will be controlled by platform integrators who can be in the same formations, in the rear area, or remote from the combat operation.

The trend toward a smaller, more technologically enhanced and capable Army with more skilled and specialized



soldiers will continue. As the total number of soldiers decreases, the value and importance of each soldier on the battlefield increases. Soldiers at the junior noncommissioned officer (NCO) level will need to be systems managers. This implies that sergeants in systems management, information management, and electronic warfare specialties may require an associate degree or advanced training in other technologically focused fields. Senior NCOs will need to be systems integrators. Even entry-level personnel in these and other skill areas may need to have advanced levels of technical training. Entry-level assignments may be at higher specialist levels after completing two years of college. In order to recruit and retain such high quality individuals amid intense competition from institutions of higher learning and private industry, compensation and entitlements will need to be enhanced significantly from present levels.

As the Army transforms, required soldier attributes will become more specific. The need for "compressed capability," or greater skills resident in each individual, will require a greater investment in the professional development and training of every soldier since each must operate in

an environment that gives full range to his or her initiative as technology amplifies human potential. An outcome of this process will be the need for soldiers to have access to Internet delivered distance learning. The implication is that every soldier will be issued a personal laptop computer, not only to maintain proficiency, but to accomplish personal transactions related to pay, leave, travel, and professional development.

The Army's people will remain its most critical resource as it transforms to the Objective Force. We have learned how to defend the nation's interests with a smaller force—yet remain formidable to our potential adversaries—by adopting innovative technology and doctrine. Incorporating cutting-edge methods is a double-edged sword, requiring higher skills of leaders, technicians, and soldiers, while potentially enabling others with lesser skills or training.

It takes time to grow soldiers. As the Army seeks to stand up Interim brigades and eventually, the Objective Force, the implications on the Army's current force structure are compelling. There will be significant growth in the Signal and Military Intelligence functional areas with offsets in others, and there will be a consolidation within the combat arms. While the Army manning system can create sufficient numbers of entry level soldiers on short notice, the same cannot be said for NCOs and officers requiring several years of experience. This is a dilemma we currently face. One possible solution is to contract out functions currently being done by certain uniformed soldiers in the Institutional Army, and reassign soldiers currently performing these functions to the Operational Army. Still, large numbers of soldiers will need to be retrained into new specialties to align them for the force structure of the transforming Army.

Annex H

Joint Interoperability

Interoperability can be defined as the ability of people, procedures, and equipment to work together effectively and efficiently under all conditions of battle. The centerpiece of joint interoperability is the Command, Control, Communications, Computers, and Intelligence for the Warrior (C4IFTW) concept. This common vision focuses on a global C4I infrastructure that satisfies the total information requirements of the warfighters. The C4IFTW concept establishes a set of objective C4I goals that serve as a foundation for new infrastructure with capabilities that provide a seamless, interoperable network of fused information. The technology that is

required to provide this capability, in some cases, has not been developed and truly is a vision of future technological advances (Figure H-1).

THE ARMY ENTERPRISE STRATEGY

The AES is the capstone effort to unify and integrate a wide range of command, control, computers, communication, and intelligence information technology (C4I/IT) initiatives from the foxhole to the sustaining base. It meets the requirements of the Clinger-Cohen Act of 1996 by providing a coherent mechanism for the selection, management, and

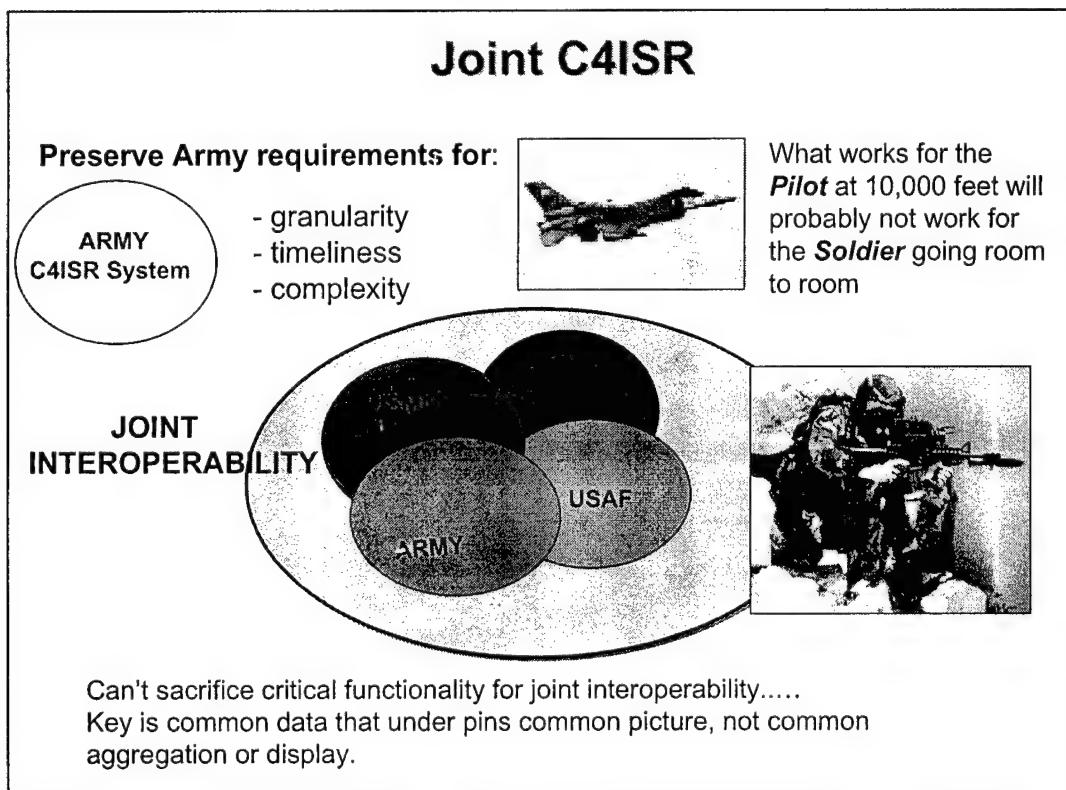


Figure H-1
Joint C4ISR

evaluation of information technology investments. The AES supports digitization by implementing a sound, integrated information technology architecture (the Army Enterprise Architecture) and Horizontal Technology Integration (HTI).

The Army Enterprise Architecture (AEA) is a comprehensive blueprint for information systems that cuts across functional domains and Service boundaries. This blueprint is the basis for an information technology investment strategy that ensures the effective design and evolution of Army information systems. It is consistent with DoD architecture, as well as with those of other Services. The AEA ensures that all Army systems that produce, use, and exchange information electronically adhere to established compatibility guidelines.

Horizontal technology integration is the application of common technologies across the force to increase force effectiveness. Such integration of common technologies and components on multiple platforms facilitates interoperability and reduces acquisition program costs. Formally proposed in 1993, HTI has been in effect in the Army for several years. A General Officer Working Group manages the program by reviewing candidates for HTI and making decisions on potential HTI programs. HTI is the preferred method for ensuring interoperability while achieving new or improved capability in weapon system programs.

JOINT INITIATIVES

There are a number of initiatives underway between the Army and other Services leading toward Joint digital interoperability. For example, the Marine

Corps has purchased the Army's Combat Service Support Control System (CSSCS) and Advanced Field Artillery Tactical Data System (AFATDS). They are also purchasing Single Channel Ground and Airborne Radio System (SINCGARS) and Enhanced Position Location reporting System (EPLRS) radios, and are in the early stages of defining and developing a Tactical Internet, compatible with the Army's tactical network-centric capabilities. The Army has been working closely with the U.S. Air Force to develop the Situational Awareness Data Link, manage its fielding and develop Joint doctrine. In addition, a number of Secretary of Defense-sponsored Advanced Concept Technology Demonstrations cut across Service boundaries.

Key to achieving digital interoperability of Service systems will be development of a Joint Operational Architecture (JOA) that defines the information exchange requirements (IERs). The lack of a developed JOA at the Division and Corps level continues to be a major obstacle to the coordinated development of joint systems and interoperable tactics, techniques and procedures (TTP). While efforts are taking place between the Marine Corps and Army to reach agreement on an acceptable architecture for information exchange, the Services could benefit from the Joint Staff validating IERs and providing them to the Services as part of a consolidated JOA.

Coordinating joint interoperability and ensuring systems are capable of interoperating over constant time periods is a complex systems engineering and integration challenge. One of the complicating factors is the number of system interfaces. For example, Figure H-2 shows only the Army Battle

Command System external interfaces to joint systems. The configuration management of the smallest details from network protocols to message standards is required to maintain interoperability. A change in one standard or system implementation may have an effect on many different systems and may be costly or time sensitive to regaining interoperability. Additionally, legacy systems and the speed of technology turnover exacerbates individual system efforts to maintain interoperability.

TRADOC has initiated the Multi-Service C2 Flag Officer Steering Committee (MSC2 FOSC). The FOSC first convened on 7 December 1999. Members include:

USA TRADOC DCG-Futures, LTG Rigby; USMC Commander MCCDC, LTG Rhodes; USAF AC2ISRC Commander, Maj Gen Perryman; USN N6B, RADM(S) Brooks; as well as the following participants: SOCOM SOIO; Joint Forces Command J-6, J-7, J-8; JTAMDO; and Joint Staff J-6, J-3. The FOSC held a VTC on 4 Feb 00 and agreed to authorize the formation of the first Operational Working Group to address CAS-gateway issues. They also agreed to a plan of work/meetings through June 2000, the date of the next FOSC.

Much of the Army's tactical network-centric capabilities will be based on the Tactical Internet. At brigade and below

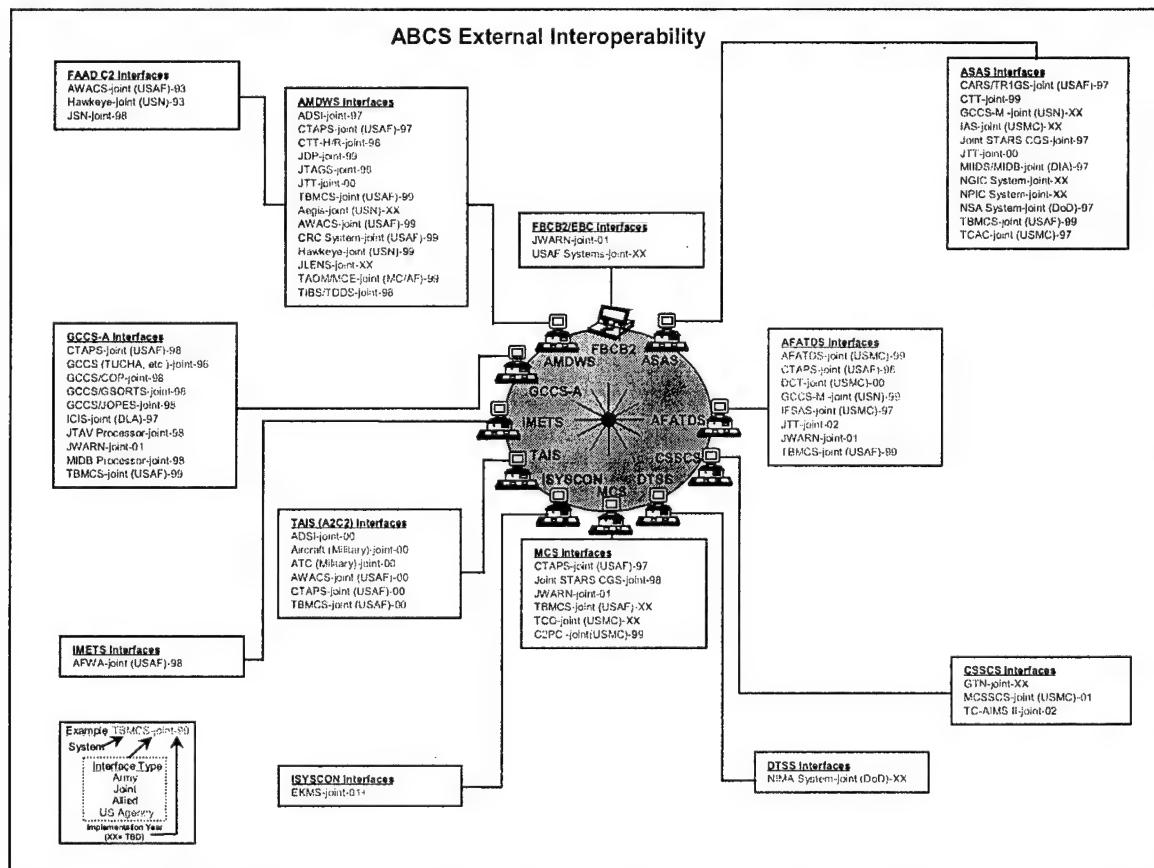


Figure H-2
Current and Projected ABCS External Interoperability

echelons, the TI is largely based on Single Channel Ground and Airborne Radio System (SINCGARS) and Enhanced Position Location Reporting System (EPLRS) radios. For the FDD, the Army will have implemented two primary joint message standards in all of our key C2 systems; However, both standards, USMTF and VMF, will not be implemented simultaneously in all systems.

In continued efforts to achieve joint interoperability, the Army will:

- ◆ Seek development of a joint architecture plan (TPIO-ABCS);
- ◆ Pursue interoperability through the MS C2 FOSC to achieve a Joint Tactical Common Operational Picture at the unit level;
- ◆ Leverage the Interoperability Joint Warfighting Capability Analysis (I-JWCA) lead in the End-to-End Interoperability Study;
- ◆ Monitor JCF AWE Issues and Initiatives (See Annex B) to ensure joint interoperability remains an experiment focus. The JCF AWE is one of four different experiments being conducted under the Joint Forces Command umbrella of Millennium Challenge '00 taking place during the period 21 August–20 September 2000;
- ◆ Participate in all Joint Forces Command sponsored Joint Experiments starting with Global Challenge '04;
- ◆ Rely on the Joint Command and Control Integration/Interoperability Group (JC2I2G) to enhance the ability of the Commanders-in-Chief (CINCs) of the nine unified commands and United Nations Command Korea to

command and control forces. The JC2I2G consists of the Commanders of the three Services' C4I Development Centers as well as the Joint Forces Command, Director of C4I (J6). The JC2I2G and its executing organizations, the three CINC Interoperability Program Offices and the Joint Forces Program Office are chartered by USD(A&T) and ASD (C3I) to identify and resolve current interoperability issues, ensure new systems are 'born joint' and exploit C4ISR opportunities through joint service experimentation. Through direct interface with the CINCs, the CIPOs/JFPO are attacking and resolving existing CINC interoperability problem areas. Interactions with the Joint Staff, the Joint C4ISR Battle Center and other groups are ensuring interoperability requirements receive top level attention for all new acquisitions at the very earliest stages of a program. Finally, the CIPOs/JFPO have participated in exercises such as Combined Endeavor and are ensuring test and integration facilities available for interoperability testing at the development centers and elsewhere are coordinated and integrated.

- ◆ Attend USMC Interoperability Workgroup meetings and ensure continued cross-service attendance at like meetings;
- ◆ Participate in various studies (like J6 sponsored Sensor to Shooter study) and coordinate issues as necessary;
- ◆ Implement joint message standards in all key Army command and control systems along with continuous validation of DII COE compliance;

- ◆ Focus RAND study efforts on developing interoperability solutions; and,
- ◆ Participate in the Theater Battle Management Core System (TBMCS) and Army Battle Command System (ABCs) Joint Information Exchange Requirement (JIER) assessment by the Joint Battle Center (JBC).

MARINE CORPS INTEROPERABILITY INITIATIVES

The ADO has promoted the exchange of operational and technical information between Army organizations and the Marine Corps Combat Development Command (MCCDC) and Marine Corps Systems Command (MARCORSYSCOM). The dialogue between Army and Marine Corps activities is steadily increasing. An example is the recent effort to develop a Memorandum of Agreement (MOA) between the USMC and Army for ensuring interoperability between the USMC Tactical Combat Operation (TCO) system and the Army's Maneuver Control System (MCS). Additionally, the Army is currently involved in the USMC's Kernel Blitz '01 planning process to integrate an Army Tactical Operations Center (TOC) into the TI as part of the Extending the Littoral Battlespace ACTD initiative in support of Marine Corps maneuvers from ship to shore. There was strong agreement to work towards more joint/coalition operational, system and technical architectures; and to establish a series of meetings to develop interoperability through a strategic management plan.

USAF AND NAVY INTEROPERABILITY INITIATIVES

In January, 1999, the Army hosted the Army-Air Force Warfighter Talks at Fort Benning, Georgia, focusing on Air-Ground Cooperation. Topics discussed included: recent operations in Southwest Asia and Kosovo, respective Service visions, experimentation programs, senior leader development, joint C4ISR interoperability, and mobility programs. The Army and Air Force will cooperate in the near term on information-based logistics, precision engagement, reachback targeting, and massing long-range fires, all relatively new areas that will benefit from digitization. A key action item from this meeting for the 2000 Warfighter Talks will be an interoperability briefing to be presented by TRADOC.

The Army has been working with the Air Force on Situational Awareness Data Link (SADL) development, fielding and joint doctrine. In addition, work with the Air Force is underway to display Army location information (Battlefield Geometry) on the Air Force Common Operational Picture (COP), and to display Air Force

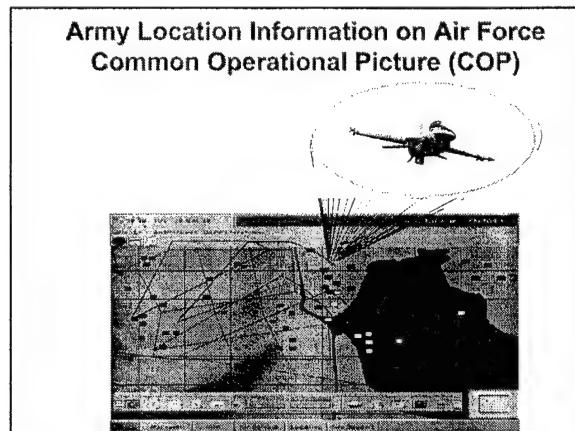


Figure H-3
Air Force COP

Airspace Control Measures (ACMs) on the Army common operational picture (COP) (Figure H-3).

The Army is currently working with the Navy during the Joint Contingency Force –Advanced Warfighting Experiment (JCF-AWE) to establish a COP, perform collaborative planning, and digital message exchanges. This is all being planned and coordinated under the guidance of the JFCOM/JBC as part of Millenium Challenge '00, a Joint experiment.

COMMON DATABASE

Future joint interoperability anticipates the development of a Common Database with the following advantages over Service-specific databases:

- ◆ One time data entry with multiple reuse;
- ◆ Leverages current efficiencies;
- ◆ Shared functionality on every machine;
- ◆ Machine efficiencies;
- ◆ Use of a unique organization identifier for every organization; and,
- ◆ Joint and Combined Application.

Annex I

Multinational Interoperability

As evidenced by the lessons learned in the Persian Gulf, Joint and multinational operations on a worldwide scale are now the norm. The numerous smaller scale contingency operations almost certainly suggest that we will operate in a Multinational force environment in the continuum of warfare from peacetime to regional conflict. Joint Task Force (JTF) commanders must be able to fully integrate their component resources into a seamless "system of systems" providing an improved situational awareness and rapid response to the dynamics of the battlegroup. The Joint Chiefs of Staff initiated the C4I For The Warrior concept. The vision of C4I For The Warrior is the establishment of a global C4I capability allowing the warfighter to plug in anytime, anywhere, in the performance of any mission.

General Shalikashvili, former Chairman of the Joint Chiefs of Staff, declared in Joint Vision 2010 that it is not enough just to be Joint when conducting future operations. He challenged "to find the most effective methods for integrating and improving interoperability with allied and coalition partners."

Challenges associated with forming coalitions will increase considerably as the number of potential partners expands and the gap increases between their capabilities and those of the U.S. Dissimilar training, equipment, technology, doctrine, and language will continue to challenge coalition partners across the full range of military operations. Peacetime engagement activities are crucial to maintaining an acceptable level of interoperability with coalition partners. Long-standing

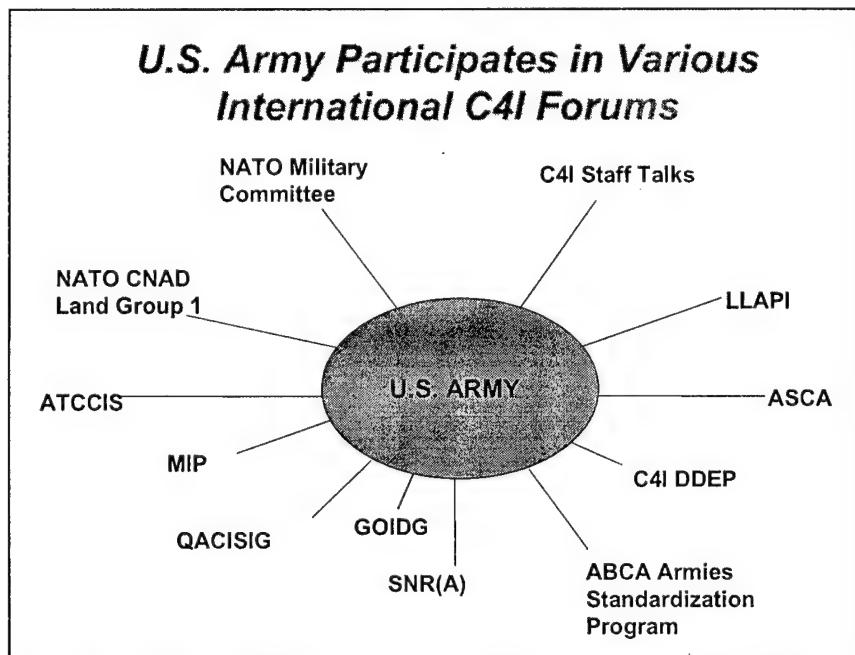


Figure I-1
Multinational Initiatives

alliances will continue to be key because of the internal stability they foster.

The U.S. Army has focused most of its work to achieve multinational digital interoperability within NATO and American, British, Canada, Australian (ABCA) working groups (Figure I-1). It works with those major allies with modernized equipment that have the desire to work with the U.S. to achieve the benefits of digital interoperability. Particular importance is attached to the digital interoperability of C4I systems. This leads to the need for requirements regarding the exchange of information between allied operational staffs. Additionally, agreement must be reached on compatible technical standards and systems architectures. Key to developing these agreements is the establishment of standing multinational bodies with the technical experts to work the issues to acceptable conclusion.

Achieving multinational force compatibility is based on the following underlying concepts: adopting commercial standards to achieve open systems; using existing C4I forums to promote the integration of the Army's digitization initiatives; leveraging both domestic and foreign advances in technology; and pursuing the application of emerging technologies to support multinational warfare and combat operations.

MULTINATIONAL INTEROPERABILITY PROCESS

The process for developing a digital systems architecture is an iterative one. It comprises an Operational Architecture (OA), Technical Architecture (TA), and Systems Architecture (SA). The definition and adherence to these architectures are

essential to international force interoperability. This process begins with the OA and concludes with live exercises. Steps in the process can be repeated to the extent necessary to correct any unacceptable deficiencies. The international strategy is to expand the existing Army process to include international partners as appropriate.

Through participation in development programs with major allies, the U.S. Army is working toward digital interoperability with coalition partners. Our major NATO and ABCA allies are cognizant of our First Digitized Division/Corps digitization efforts and participate in various technical working groups with us. By 2003, the U.S. Army will have command and control system interoperability with the armies of Canada, Denmark, France, Germany, Holland, Italy, Spain, and the United Kingdom.

Army participation in key international forums is essential for coordination and cooperation of multinational digitization activities with coalition partners. These forums provide a mechanism for harmonizing the operational, system, and technical architectures of the member armies. Participation in international forums also facilitates the leveraging of advanced and emerging technologies identified as candidates for meeting future Army requirements.

INTERNATIONAL PROGRAMS

Key groups with the greatest potential for contributing to the digitization effort include:

North Atlantic Treaty Organization (NATO) C3 Board

The NC3B is comprised of eight sub-committees, of which sub-committees 1, 2, and 5 are relevant to Information Exchange Requirements/Message Text Format (IER/MTF) development. The overall NC3B structure is portrayed in Figure I-2.

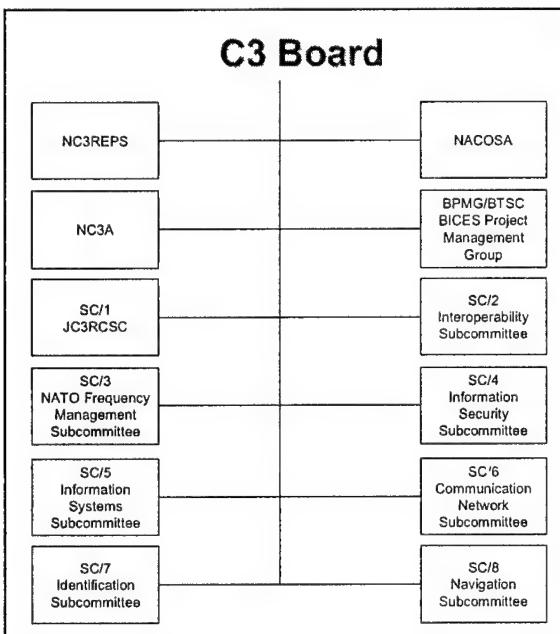


Figure I-2
NATO C3 Board Structure

NATO Joint C3 Requirements and Concepts Sub-Committee (JC3RCSC)

The JC3RCSC supports the NATO Military Committee (MC) and the major NATO commanders by harmonizing operational requirements and developing standard policies and procedures for tactical communications in air, land, and maritime operations. The JC3RCSC is supported by separate Air, Land, and Marine working groups that meet semi-annually and are responsible for the

development, review, and harmonization of requirements, concepts, policy and procedures.

NATO Interoperability Sub-Committee (ISC)

The ISC is responsible to the NC3B for establishing C3 standardization policy and improving the interoperability of NATO and NATO-related C3 systems in support of consultation, command and control. It is the senior de facto sub-committee, as it comprises the NC3B national representatives and representatives of the Major NATO Commands, NC3A, Military Agency for Standardization (MAS) and Office of NATO Standardization. In addition to its overarching policy function, it is responsible for establishing and maintaining C3 standardization objectives and providing the strategic framework for interoperable NATO C3 systems for both military and civil use.

NATO Conference of National Armaments Directors (CNAD)

The Conference of National Armaments Directors (CNAD) coordinates the development of armaments by member countries. It reports directly to the North Atlantic Council and oversees a number of subordinate bodies that are charged with promoting cooperative research and development and the production of future military equipment. These bodies also develop materiel-related Standard NATO Agreements (STANAGs). The CNAD is supported by separate Air, Land, and Naval working groups, as well as an Industrial Advisory Group. The CNAD also oversees groups that work on functional issues related to research, development, and procurement of military equipment.

NATO Army Armaments Group, Land Group 1 (NAAG(LG1))

The NAAG is the CNAD body involving the most extensive U.S. Army participation. Its membership includes senior Army officials responsible for research, development, and acquisition. The principal U.S. Army representative to the NAAG is the Military Deputy to the Deputy Under Secretary Army for International Affairs (DUSA-(IA)). Meetings of the land groups are conducted once or twice a year at NATO headquarters in Brussels, Belgium. U.S. representatives to these forums are provided by HQDA, AMC, TRADOC, and other major commands as appropriate. At the LG1 meeting, some topics of discussion were operational interoperability requirements, common data modeling, technical interoperability requirements, and the interoperability of battlefield management systems.

Senior National Representative (SNR) Forums

The Four Power NAD Forum was established to develop consensus among the NADs of France, Germany, the United Kingdom, and the United States on issues relevant to the full CNAD. In addition, the forum addresses cooperative projects and issues involving only the Four Power countries.

The U.S. delegation consists of the NAD (USD (A)), the Deputy NAD (DUSD-(IA)), and a small support staff. The Four Power NADs meet semi-annually, shortly before the full CNAD meeting. The Four Power Deputy NADs also meet separately twice a year.

To facilitate the coordination and effective management of international programs at the working level, the Four Power NADs directed the establishment of separate forums for national representatives from each nation's Army, Navy, Air Force, and C3 communities. These forums oversee and guide the management of specific information exchange agreements and cooperative projects among the participants. Each SNR forum operates through a network of separate working groups, which are established and terminated by the respective SNR to address specific issues or areas of interest. Each SNR forum meets once a year, usually in the fall, shortly before the respective CNAD main group meeting.

The DUSA-(IA) designates the U.S. Senior National Representative (Army) (SNR(A)), who is responsible for appointing the U.S. cochairman for each working group. SNR(A) objectives have been codified in a memorandum of understanding (MOU) that also establishes the procedures for establishment and management of working groups. Among other things, it defines a process for documenting, in separate MOU annexes, terms of reference for each working group.

Quadrilateral Army Communications and Information Systems Interoperability Group (QACISIG)

The QACISIG is a forum that reports to the SNR(A). It was created to achieve, within the timeframe 1995–2010, command, control, and communications interoperability between the Armies of the participating nations. Its focus is on the development and resolution of command and information systems technical and doctrinal interoperability issues between

the United States, United Kingdom, France, and Germany with a focus on digitization requirements.

American, British, Canadian and Australian (ABCA) Armies Standardization Program

The ABCA Program was established under the Basic Standardization Agreement of 1964, which was signed by the Armies of the United States, the United Kingdom, Canada, and Australia. The New Zealand Army became associated with the program in 1965. The aims of the ABCA program are to:

- ◆ Ensure the highest degree of cooperation among member armies;
- ◆ Achieve the highest degree of interoperability among signatory armies through materiel and non-materiel standardization; and,
- ◆ Obtain the greatest economy through the use of combined resources and effort.

Bilateral Forums

Bilateral forums are an important tool in achieving the Army's objectives and to provide the Regional Commanders in Chief (CINCs) the capability to employ Army forces effectively and efficiently as a member of a multinational coalition across the full spectrum of military missions. Army participation in bilateral forums with potential coalition partners provides a means to harmonize concepts, doctrine, training, operational procedures and requirements; promote cooperative research, development and acquisition of materiel; and facilitate cooperative logistics support.

TRADOC Staff Talks

Yearly discussions between our allies and the U.S. Army Training and Doctrine Command (TRADOC) provide a forum to initiate actions for the development of agreements on various warfighting issues.

Defense Data Exchange Program

One aspect of the cooperative RDA process includes exchanges of data among allied and friendly governments. The Defense Data Exchange Program (DDEP) governs the exchange of data and information. Data exchanges eliminate the Army's need to duplicate tests and evaluations performed by the source nation. It can also supplement existing information with new tests and evaluations, conducted under differing environmental or other conditions.

THE COMMAND AND CONTROL SYSTEMS INTEROPERABILITY PROGRAM

A number of cooperative programs are currently in place or being planned. One of the most important of these is the Command and Control Systems Interoperability Program (C2SIP). The C2SIP is the U.S. Army's national program consolidating the work already accomplished or planned far in the future related to the several international programs (Figure I-3).

In order to secure additional funding, to elevate the visibility of the effort within the Services and to find a quicker way to field capability, C2SIP (Figure I-3) was tied to the C4I for Coalition Warfare Advanced Concept Technology Demonstration (ACTD) in fiscal year 1998. The C4I for Coalition Warfare and was endorsed as

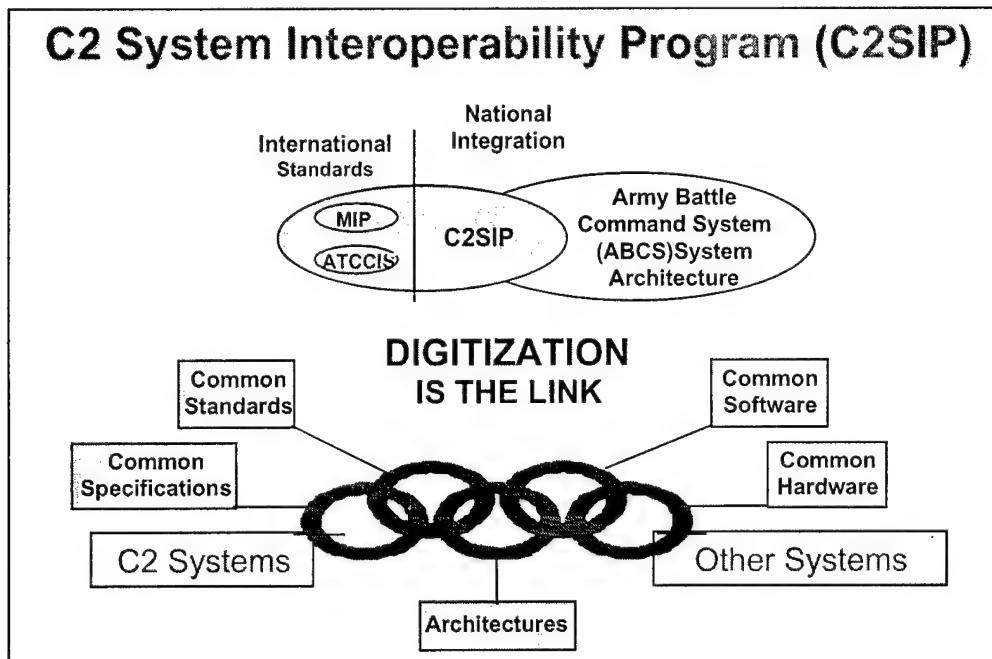


Figure I-3
C2SIP

an ACTD on 5 December 1997. The concept was endorsed as a requirement by the Joint Requirements Oversight Committee (JROC) in July 1997.

PEO C3S is carrying out the development of C2SIP in conjunction with the U.S. Army Communications-Electronics Command (CECOM) Research Development and Engineering Center (RDEC). C2SIP provides a structured program for further developing the interoperability capabilities but now ties that development to a fielding schedule using the Maneuver Control System (MCS) as the host system. C2SIP will allow the U.S. Army to deploy a flexible capability that will enable MCS to operate at different hierarchy levels with Command and Control Information Systems (CCIS) from several other countries by 2003.

The C2SIP concept revolves around the creation of an interoperability data structure to which agreed international messages (currently from the BIP/QIP initiatives) are mapped. The information to be exchanged will cover situational awareness, plans and orders and control measures data. A database will be developed from the Army Battle Command System (ABCS) Transformation Data Model (ATDM) which will have the ATCCIS Generic Hub Version 3 (GH3) integrated into it. The U.S. host system, MCS, will use the interoperability database to both generate and receive internationally standardized messages or replicated data. PEO C3S will use adapted versions of Defense Information Infrastructure (DII) Common Operating Environment (COE) products as a means of integrating the international specifications into MCS.

These products will provide the message handling and communications processing software based on the ATCCIS Replication Mechanism (ARM). The current communications solutions from BIP and QIP (LAN at a secure site through a gateway) will be used initially with further research into other communications means. The entire module will form a part of the ABCS systems architecture and, therefore, be readily transferable to other Army systems. A key point behind the concept is the re-use of software and the refinement and adoption of already developed international standards.

The first phase (basic message capability) was accomplished in 2000, and the second phase will be the fielding of an advanced message and controlled selective data replication capability in 2002. By 2003, the Army will have a flexible capability to exchange data with allies who have only one of the two capabilities. Work is now underway with the other U.S. military departments to identify requirements for passage of coalition land force data to their C2 systems and to involve them more closely with C2SIP. The C2SIP encompasses the following international efforts:

Army Tactical Command and Control Information System (ATCCIS)

ATCCIS is sponsored by Supreme Headquarters Allied Powers Europe (SHAPE) and is the initiative of eleven NATO nations. It is a Corps to Brigade level interoperability initiative that revolves around a standardized data model and data replication between systems.

Multilateral Interoperability Program

In April 1997, program managers for the principal C2 systems of the Canadian, French, German, Italian, British and U.S. armies agreed to a reorganization of the international process to achieve C2 system interoperability. This initiative is the Multilateral Interoperability Program (MIP). All countries have committed themselves to the development and fielding of a NATO standard AdatP-3 message and data replication based interoperability system by 2005. There is potential for interoperability with Norway, Portugal, Spain, Denmark, and the Netherlands. The United States will be able to field its full capability by 2003.

FUTURE TESTING

A key component of the international digitization strategy is the use of demonstrations and experiments to evaluate developed capabilities in an operational environment, determine requirements for interoperability, and make allied partners aware of U.S. Army digitization efforts (Figure I-4). Further coalition participation will be pursued on a selective basis so as not to adversely impact any U.S. program.

For the longer term a process of multinational demonstrations and exercises are being developed. This process is intended to reflect the U.S. Army's own digitization approach of "build a little, test a little."

It is expected that each nation will demonstrate developing capability tied to where they are in their own national digitization R&D schedules.

Under the direction of the General Officer International Digitization Group (GOIDG)

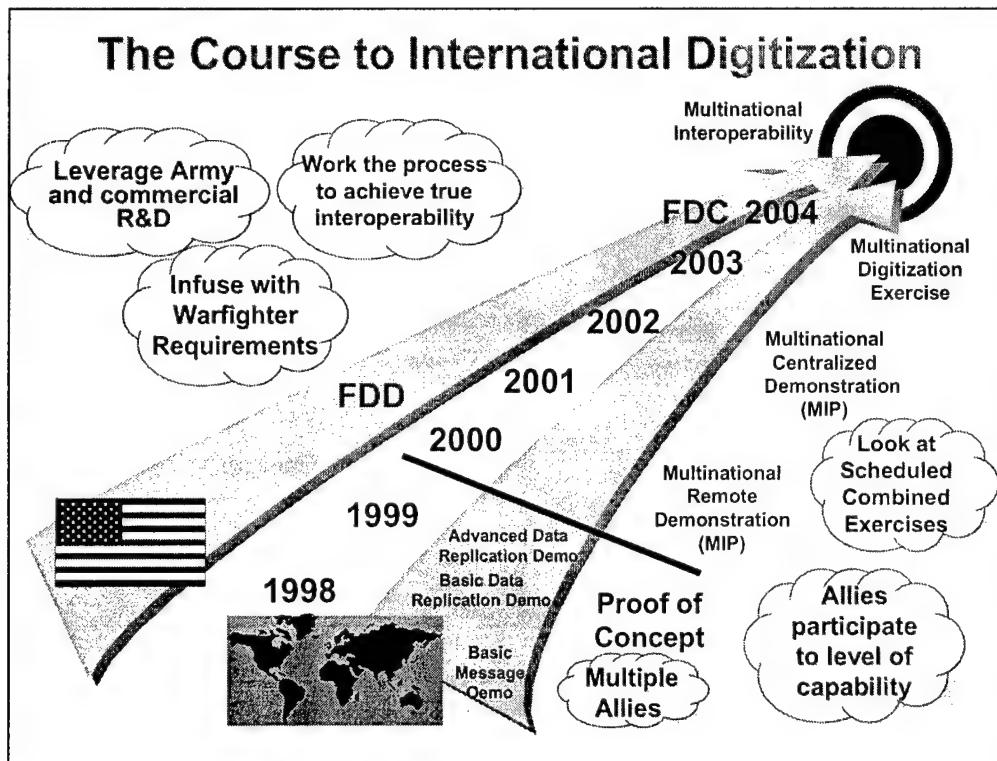


Figure I-4
The Way Ahead

and the Quadrilateral Armies Communications and Information Systems Interoperability Group (QACISIG), the first Multinational Digitization Interoperability Exercise (MDIE) Working Group Meeting was held in February 2000. It included representatives from France, Germany, United Kingdom, and the U.S. The purpose of the meeting was to begin a dialog aimed at establishing the goals, objectives, organization and timeframe to conduct a Coalition C3 interoperability exercise. Tentative agreement was made to conduct a Command Post Exercise (CPX) in late FY04 or early FY05, with a proposed location of Central Europe. The MIP will be the primary program to demonstrate C2 interoperability for message and database transfer.

Simulation of forces will be used to the maximum extent possible.

OTHER COOPERATIVE PROGRAMS

Combat Identification Program

The Combat Identification Program is an initiative of the United States, Germany, France, and the United Kingdom. In 1992 to exchange information on procedures and systems to reduce the risk of fratricide while maximizing combat effectiveness through interoperability. The CBT ID Working Group (CIWG) has been pursuing this goal by seeking improvements to Battlefield Combat Identification through improved Target Identification (TI) combined with improved

Situational Awareness (SA). The initial focus has been to improve ground-to-ground mounted TI and provide potential for integrating battlefield picture information with TI information, and enable provision of target ID information to battlefield management/information systems. The ultimate objective is to improve identification for all ground-to-ground and air-to-ground mission areas through interoperable SA and TI across NATO.

In December 1999, CIWG submitted a draft for staffing leading to ratification of STANAG 4579 for Battlefield Target ID Devises (BTID) to specify the technical performance characteristics for an interoperable NATO TI device." Additionally, an Operational Architecture for ID in NATO is currently being developed under the NC3B SC/1. The aim of the document is to serve as the basis for development of a Systems Architecture for ID in NATO. Emphasis on the need for interoperable, joint ID covering all aspects of air, land and maritime battlespace has been increased recently through the Defense Capabilities Initiative (DCI) decisions made at the Washington NATO Summit in April 1999.

Artillery Systems Cooperation Activities (ASCA)

The aim of ASCA is to develop and maintain an embedded operational interface for Field Artillery/Fire Support Command and Control Systems of the participating Nations. The purpose is to

provide functional Fire Control interoperability, which can be deployed in a dynamic, tactical and multinational environment. ASCA members are France (ATLAS), Germany (ADLER), Italy (SIR), United Kingdom (BATES), and U.S. (AFATDS). Technical system tests are scheduled for January 2002, with follow up verification of corrections testing in July 2002. Operational testing is planned in three phases. Phase 1, bilateral telephone testing, is scheduled for July thru September 2002. Phase 2, multinational full system testing, is scheduled for January thru February 2003. Phase 3, operational evaluation, is scheduled for August thru September 2003.

Low Level Air Picture Interface (LLAPI) Program

The objective of LLAPI is to enable allied SHORAD units to exchange current information on the air picture to allow direct fire for engagement operations. Participating nations are Germany and U.S. (FAAD C2I). Observer nations are France, Italy, United Kingdom, Netherlands, Turkey, Canada, Spain, Denmark, Belgium, and Norway. In June 1999, operational tests were held during Roving Sands that verified the means to transfer required data over cable interface. The program is planning for the transition from a bilateral to a multinational program and the development of a radio solution.

Annex I

Multinational Interoperability

As evidenced by the lessons learned in the Persian Gulf, Joint and multinational operations on a worldwide scale are now the norm. The numerous smaller scale contingency operations almost certainly suggest that we will operate in a Multinational force environment in the continuum of warfare from peacetime to regional conflict. Joint Task Force (JTF) commanders must be able to fully integrate their component resources into a seamless "system of systems" providing an improved situational awareness and rapid response to the dynamics of the battlegroup. The Joint Chiefs of Staff initiated the C4I For The Warrior concept. The vision of C4I For The Warrior is the establishment of a global C4I capability allowing the warfighter to plug in anytime, anywhere, in the performance of any mission.

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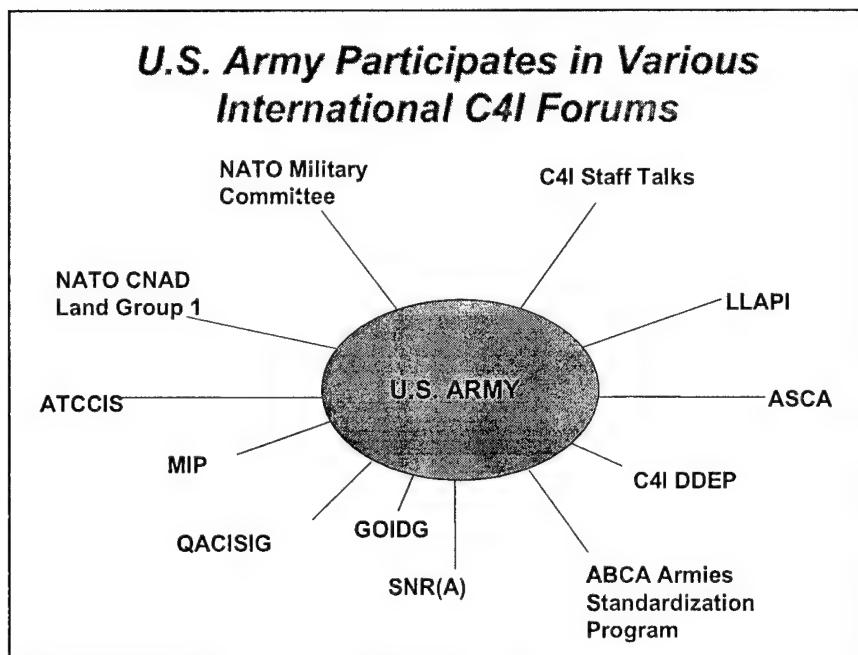


Figure I-1
Multinational Initiatives

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MULTINATIONAL INTEROPERABILITY PROCESS

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INTERNATIONAL PROGRAMS

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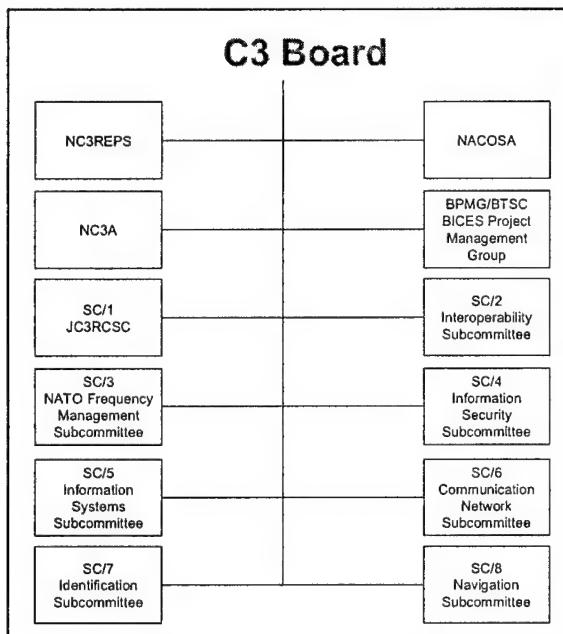


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The Conference of National Armaments Directors (CNAD) coordinates the development of armaments by member countries. It reports directly to the North Atlantic Council and oversees a number of subordinate bodies that are charged with promoting cooperative research and development and the production of future military equipment. These bodies also develop materiel-related Standard NATO Agreements (STANAGs). The CNAD is supported by separate Air, Land, and Naval working groups, as well as an Industrial Advisory Group. The CNAD also oversees groups that work on functional issues related to research, development, and procurement of military equipment.

NATO Army Armaments Group, Land Group 1 (NAAG(LG1))

The NAAG is the CNAD body involving the most extensive U.S. Army participation. Its membership includes senior Army officials responsible for research, development, and acquisition. The principal U.S. Army representative to the NAAG is the Military Deputy to the Deputy Under Secretary Army for International Affairs (DUSA-(IA)). Meetings of the land groups are conducted once or twice a year at NATO headquarters in Brussels, Belgium. U.S. representatives to these forums are provided by HQDA, AMC, TRADOC, and other major commands as appropriate. At the LG1 meeting, some topics of discussion were operational interoperability requirements, common data modeling, technical interoperability requirements, and the interoperability of battlefield management systems.

Senior National Representative (SNR) Forums

The Four Power NAD Forum was established to develop consensus among the NADs of France, Germany, the United Kingdom, and the United States on issues relevant to the full CNAD. In addition, the forum addresses cooperative projects and issues involving only the Four Power countries.

The U.S. delegation consists of the NAD (USD (A)), the Deputy NAD (DUSD-(IA)), and a small support staff. The Four Power NADs meet semi-annually, shortly before the full CNAD meeting. The Four Power Deputy NADs also meet separately twice a year.

To facilitate the coordination and effective management of international programs at the working level, the Four Power NADs directed the establishment of separate forums for national representatives from each nation's Army, Navy, Air Force, and C3 communities. These forums oversee and guide the management of specific information exchange agreements and cooperative projects among the participants. Each SNR forum operates through a network of separate working groups, which are established and terminated by the respective SNR to address specific issues or areas of interest. Each SNR forum meets once a year, usually in the fall, shortly before the respective CNAD main group meeting.

The DUSA-(IA) designates the U.S. Senior National Representative (Army) (SNR(A)), who is responsible for appointing the U.S. cochairman for each working group. SNR(A) objectives have been codified in a memorandum of understanding (MOU) that also establishes the procedures for establishment and management of working groups. Among other things, it defines a process for documenting, in separate MOU annexes, terms of reference for each working group.

Quadrilateral Army Communications and Information Systems Interoperability Group (QACISIG)

The QACISIG is a forum that reports to the SNR(A). It was created to achieve, within the timeframe 1995–2010, command, control, and communications interoperability between the Armies of the participating nations. Its focus is on the development and resolution of command and information systems technical and doctrinal interoperability issues between

the United States, United Kingdom, France, and Germany with a focus on digitization requirements.

American, British, Canadian and Australian (ABCA) Armies Standardization Program

The ABCA Program was established under the Basic Standardization Agreement of 1964, which was signed by the Armies of the United States, the United Kingdom, Canada, and Australia. The New Zealand Army became associated with the program in 1965. The aims of the ABCA program are to:

- ◆ Ensure the highest degree of cooperation among member armies;
- ◆ Achieve the highest degree of interoperability among signatory armies through materiel and non-materiel standardization; and,
- ◆ Obtain the greatest economy through the use of combined resources and effort.

Bilateral Forums

Bilateral forums are an important tool in achieving the Army's objectives and to provide the Regional Commanders in Chief (CINCs) the capability to employ Army forces effectively and efficiently as a member of a multinational coalition across the full spectrum of military missions. Army participation in bilateral forums with potential coalition partners provides a means to harmonize concepts, doctrine, training, operational procedures and requirements; promote cooperative research, development and acquisition of materiel; and facilitate cooperative logistics support.

TRADOC Staff Talks

Yearly discussions between our allies and the U.S. Army Training and Doctrine Command (TRADOC) provide a forum to initiate actions for the development of agreements on various warfighting issues.

Defense Data Exchange Program

One aspect of the cooperative RDA process includes exchanges of data among allied and friendly governments. The Defense Data Exchange Program (DDEP) governs the exchange of data and information. Data exchanges eliminate the Army's need to duplicate tests and evaluations performed by the source nation. It can also supplement existing information with new tests and evaluations, conducted under differing environmental or other conditions.

THE COMMAND AND CONTROL SYSTEMS INTEROPERABILITY PROGRAM

A number of cooperative programs are currently in place or being planned. One of the most important of these is the Command and Control Systems Interoperability Program (C2SIP). The C2SIP is the U.S. Army's national program consolidating the work already accomplished or planned far in the future related to the several international programs (Figure I-3).

In order to secure additional funding, to elevate the visibility of the effort within the Services and to find a quicker way to field capability, C2SIP (Figure I-3) was tied to the C4I for Coalition Warfare Advanced Concept Technology Demonstration (ACTD) in fiscal year 1998. The C4I for Coalition Warfare and was endorsed as

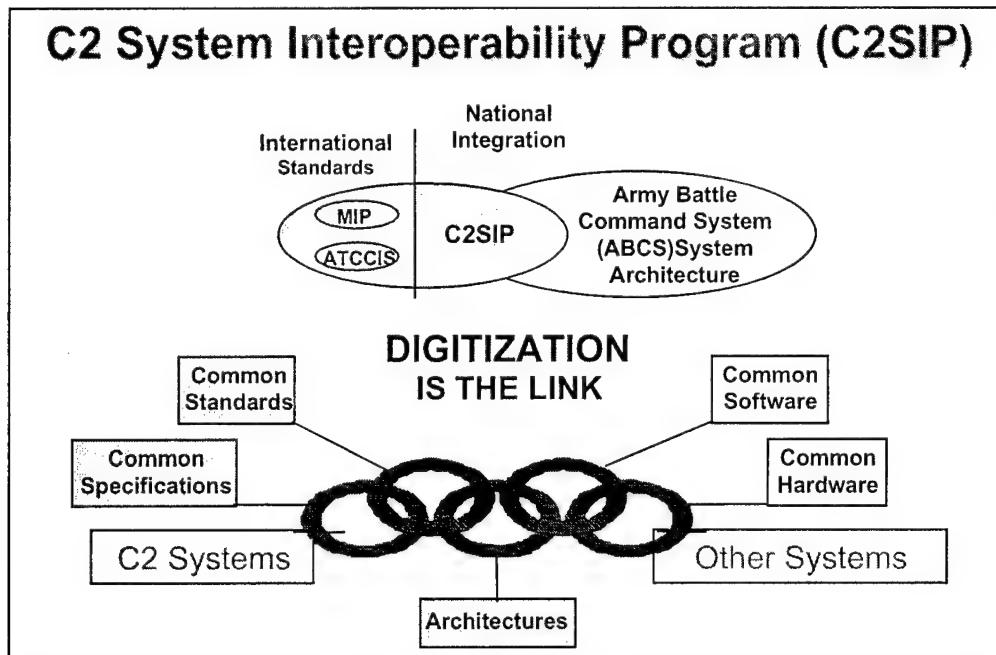


Figure I-3
C2SIP

an ACTD on 5 December 1997. The concept was endorsed as a requirement by the Joint Requirements Oversight Committee (JROC) in July 1997.

PEO C3S is carrying out the development of C2SIP in conjunction with the U.S. Army Communications-Electronics Command (CECOM) Research Development and Engineering Center (RDEC). C2SIP provides a structured program for further developing the interoperability capabilities but now ties that development to a fielding schedule using the Maneuver Control System (MCS) as the host system. C2SIP will allow the U.S. Army to deploy a flexible capability that will enable MCS to operate at different hierarchy levels with Command and Control Information Systems (CCIS) from several other countries by 2003.

The C2SIP concept revolves around the creation of an interoperability data structure to which agreed international messages (currently from the BIP/QIP initiatives) are mapped. The information to be exchanged will cover situational awareness, plans and orders and control measures data. A database will be developed from the Army Battle Command System (ABCS) Transformation Data Model (ATDM) which will have the ATCCIS Generic Hub Version 3 (GH3) integrated into it. The U.S. host system, MCS, will use the interoperability database to both generate and receive internationally standardized messages or replicated data. PEO C3S will use adapted versions of Defense Information Infrastructure (DII) Common Operating Environment (COE) products as a means of integrating the international specifications into MCS.

These products will provide the message handling and communications processing software based on the ATCCIS Replication Mechanism (ARM). The current communications solutions from BIP and QIP (LAN at a secure site through a gateway) will be used initially with further research into other communications means. The entire module will form a part of the ABCS systems architecture and, therefore, be readily transferable to other Army systems. A key point behind the concept is the re-use of software and the refinement and adoption of already developed international standards.

The first phase (basic message capability) was accomplished in 2000, and the second phase will be the fielding of an advanced message and controlled selective data replication capability in 2002. By 2003, the Army will have a flexible capability to exchange data with allies who have only one of the two capabilities. Work is now underway with the other U.S. military departments to identify requirements for passage of coalition land force data to their C2 systems and to involve them more closely with C2SIP. The C2SIP encompasses the following international efforts:

Army Tactical Command and Control Information System (ATCCIS)

ATCCIS is sponsored by Supreme Headquarters Allied Powers Europe (SHAPE) and is the initiative of eleven NATO nations. It is a Corps to Brigade level interoperability initiative that revolves around a standardized data model and data replication between systems.

Multilateral Interoperability Program

In April 1997, program managers for the principal C2 systems of the Canadian, French, German, Italian, British and U.S. armies agreed to a reorganization of the international process to achieve C2 system interoperability. This initiative is the Multilateral Interoperability Program (MIP). All countries have committed themselves to the development and fielding of a NATO standard AdatP-3 message and data replication based interoperability system by 2005. There is potential for interoperability with Norway, Portugal, Spain, Denmark, and the Netherlands. The United States will be able to field its full capability by 2003.

FUTURE TESTING

A key component of the international digitization strategy is the use of demonstrations and experiments to evaluate developed capabilities in an operational environment, determine requirements for interoperability, and make allied partners aware of U.S. Army digitization efforts (Figure I-4). Further coalition participation will be pursued on a selective basis so as not to adversely impact any U.S. program.

For the longer term a process of multinational demonstrations and exercises are being developed. This process is intended to reflect the U.S. Army's own digitization approach of "build a little, test a little."

It is expected that each nation will demonstrate developing capability tied to where they are in their own national digitization R&D schedules.

Under the direction of the General Officer International Digitization Group (GOIDG)

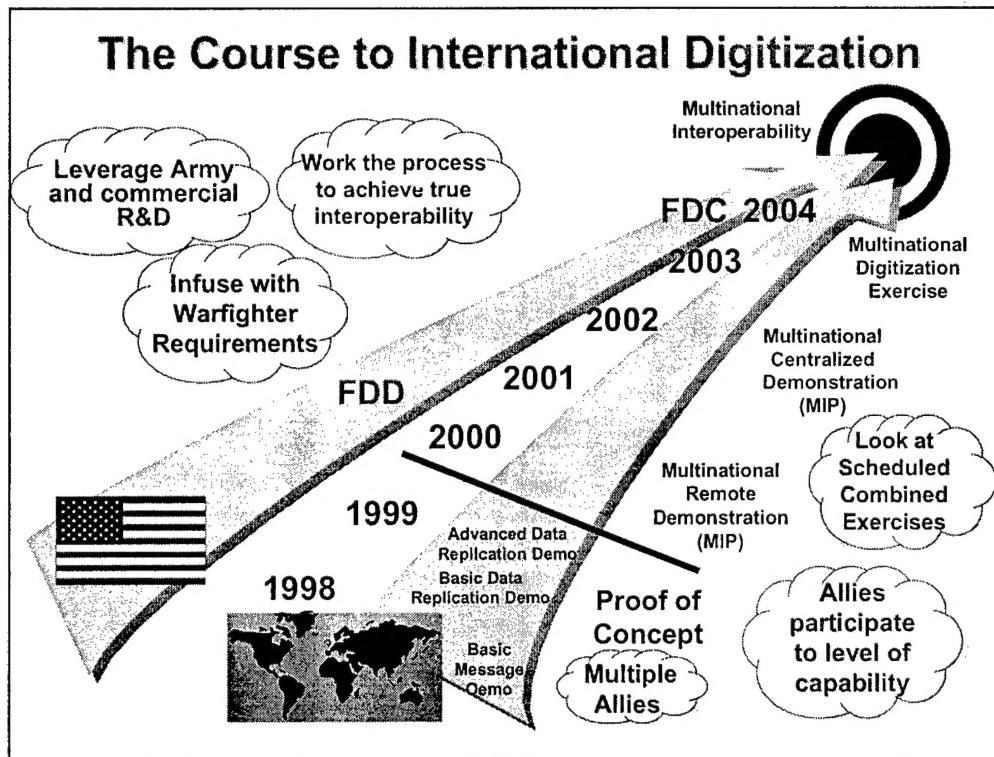


Figure I-4
The Way Ahead

and the Quadrilateral Armies Communications and Information Systems Interoperability Group (QACISIG), the first Multinational Digitization Interoperability Exercise (MDIE) Working Group Meeting was held in February 2000. It included representatives from France, Germany, United Kingdom, and the U.S. The purpose of the meeting was to begin a dialog aimed at establishing the goals, objectives, organization and timeframe to conduct a Coalition C3 interoperability exercise. Tentative agreement was made to conduct a Command Post Exercise (CPX) in late FY04 or early FY05, with a proposed location of Central Europe. The MIP will be the primary program to demonstrate C2 interoperability for message and database transfer.

Simulation of forces will be used to the maximum extent possible.

OTHER COOPERATIVE PROGRAMS

Combat Identification Program

The Combat Identification Program is an initiative of the United States, Germany, France, and the United Kingdom. In 1992 to exchange information on procedures and systems to reduce the risk of fratricide while maximizing combat effectiveness through interoperability. The CBT ID Working Group (CIWG) has been pursuing this goal by seeking improvements to Battlefield Combat Identification through improved Target Identification (TI) combined with improved

Situational Awareness (SA). The initial focus has been to improve ground-to-ground mounted TI and provide potential for integrating battlefield picture information with TI information, and enable provision of target ID information to battlefield management/information systems. The ultimate objective is to improve identification for all ground-to-ground and air-to-ground mission areas through interoperable SA and TI across NATO.

In December 1999, CIWG submitted a draft for staffing leading to ratification of STANAG 4579 for Battlefield Target ID Devises (BTID) to specify the technical performance characteristics for an interoperable NATO TI device."

Additionally, an Operational Architecture for ID in NATO is currently being developed under the NC3B SC/1. The aim of the document is to serve as the basis for development of a Systems Architecture for ID in NATO. Emphasis on the need for interoperable, joint ID covering all aspects of air, land and maritime battlespace has been increased recently through the Defense Capabilities Initiative (DCI) decisions made at the Washington NATO Summit in April 1999.

Artillery Systems Cooperation Activities (ASCA)

The aim of ASCA is to develop and maintain an embedded operational interface for Field Artillery/Fire Support Command and Control Systems of the participating Nations. The purpose is to

provide functional Fire Control interoperability, which can be deployed in a dynamic, tactical and multinational environment. ASCA members are France (ATLAS), Germany (ADLER), Italy (SIR), United Kingdom (BATES), and U.S. (AFATDS). Technical system tests are scheduled for January 2002, with follow up verification of corrections testing in July 2002. Operational testing is planned in three phases. Phase 1, bilateral telephone testing, is scheduled for July thru September 2002. Phase 2, multinational full system testing, is scheduled for January thru February 2003. Phase 3, operational evaluation, is scheduled for August thru September 2003.

Low Level Air Picture Interface (LLAPI) Program

The objective of LLAPI is to enable allied SHORAD units to exchange current information on the air picture to allow direct fire for engagement operations. Participating nations are Germany and U.S. (FAAD C2I). Observer nations are France, Italy, United Kingdom, Netherlands, Turkey, Canada, Spain, Denmark, Belgium, and Norway. In June 1999, operational tests were held during Roving Sands that verified the means to transfer required data over cable interface. The program is planning for the transition from a bilateral to a multinational program and the development of a radio solution.

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